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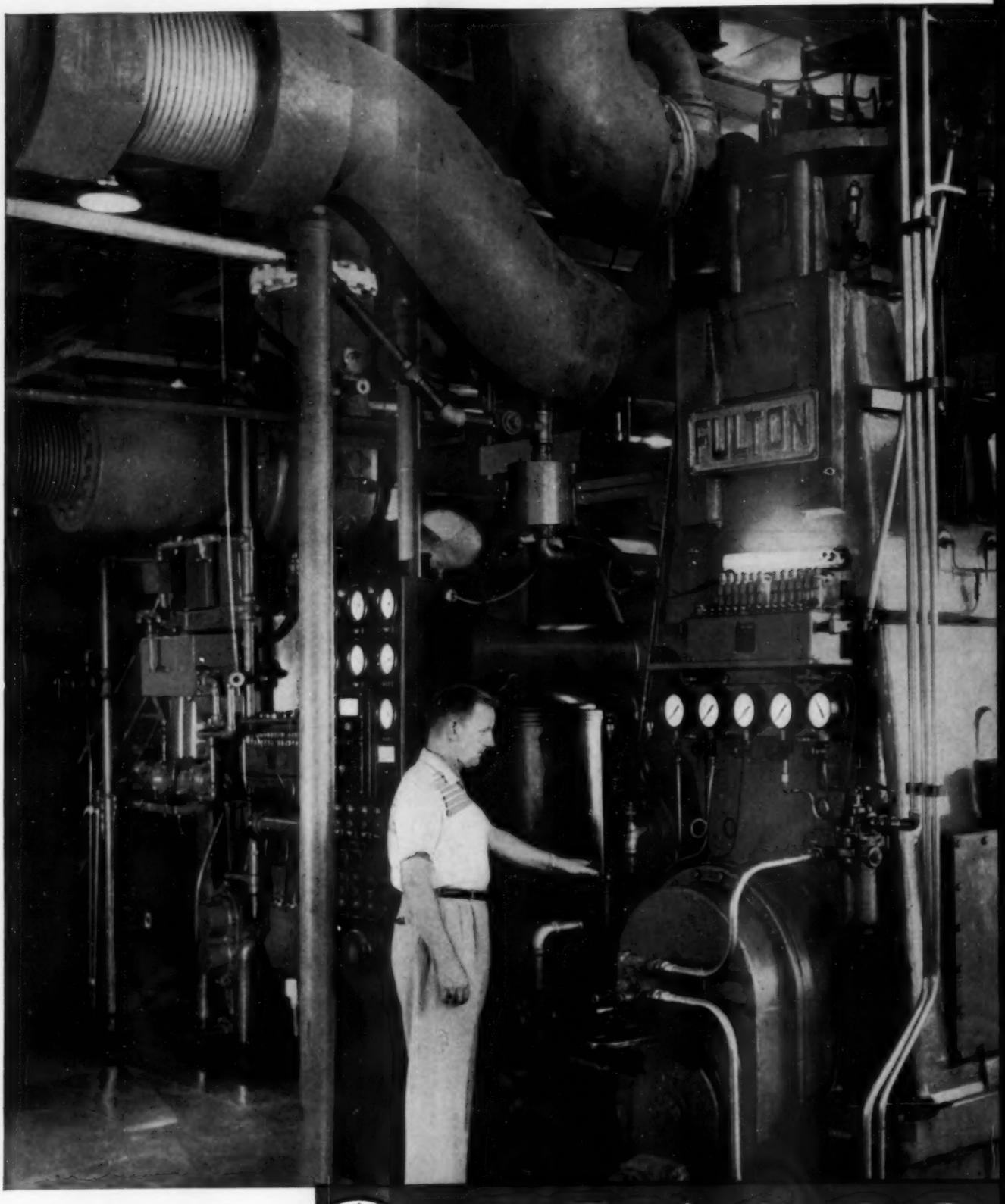

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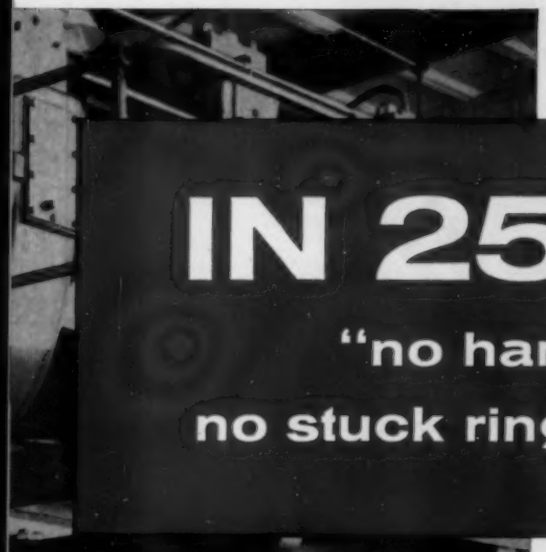

IN 25 YEARS

"no harmful deposits, no stuck rings, minimum wear"

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URSA OILS FOR ALL DIESEL, GAS AND DUAL-FUEL ENGINES

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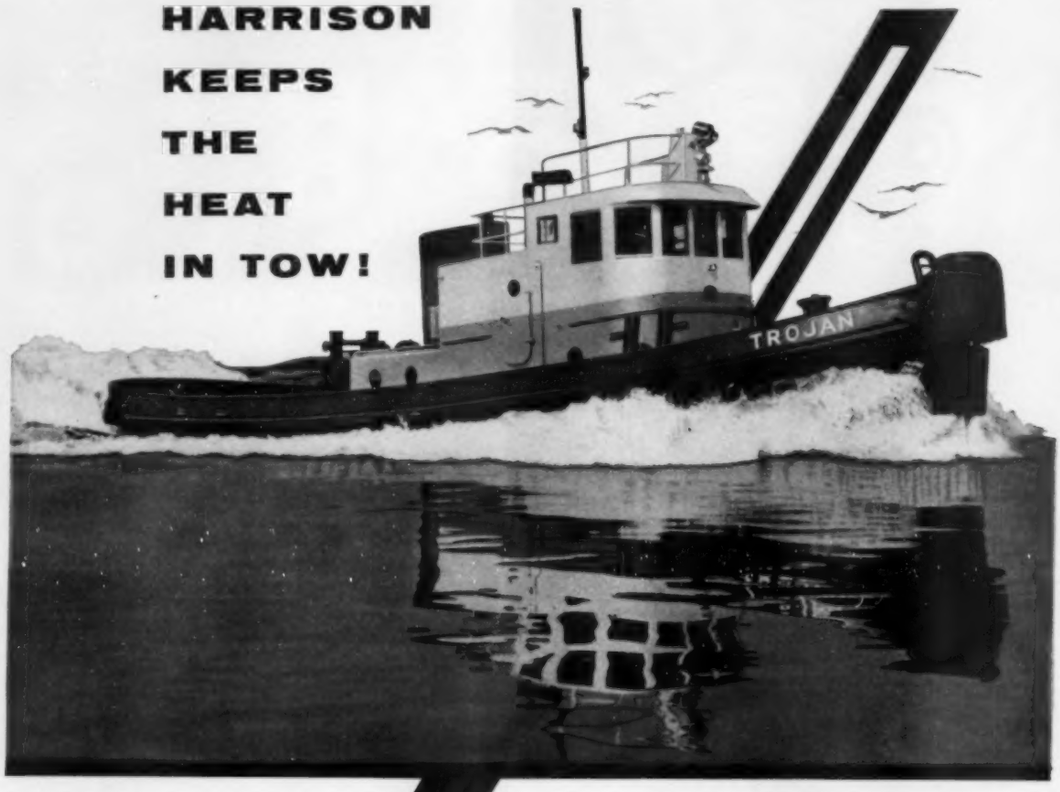
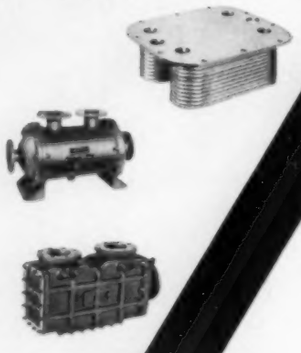


Temperatures made to order for all types of diesel engines. Harrison heat exchangers are rugged, reliable and compact . . . engineered to provide the optimum in cooling efficiency.



Harrison Heat Exchangers Help Keep This Tug on Round-The-Clock Duty for 3,456 Hours!

Harrison gives heat the slip on any ship. This tug worked a 24-hour day for months with no breakdown—with Harrison heavy-duty heat exchangers on the job. Harrison heat-control equipment provides cool performance on many of today's top marine diesels . . . assures top efficiency, endurance and economy even under heavy loads. That's because Harrison is backed with over 47 years' research and manufacturing experience which assures you of complete dependability in a top-quality product. If you have a cooling problem, look to Harrison for the answer.

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Alisa V, 96 ft long, designed by J. H. Wells and built by Broward Marine, Inc. of Fort Lauderdale, Fla., for Elmer Bobst of New York. It is powered with two 470 hp Cummins diesels. *Photo by Morris Rosenfeld, New York City.*

powered by

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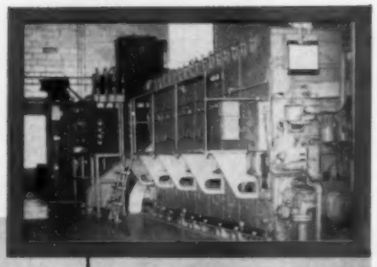

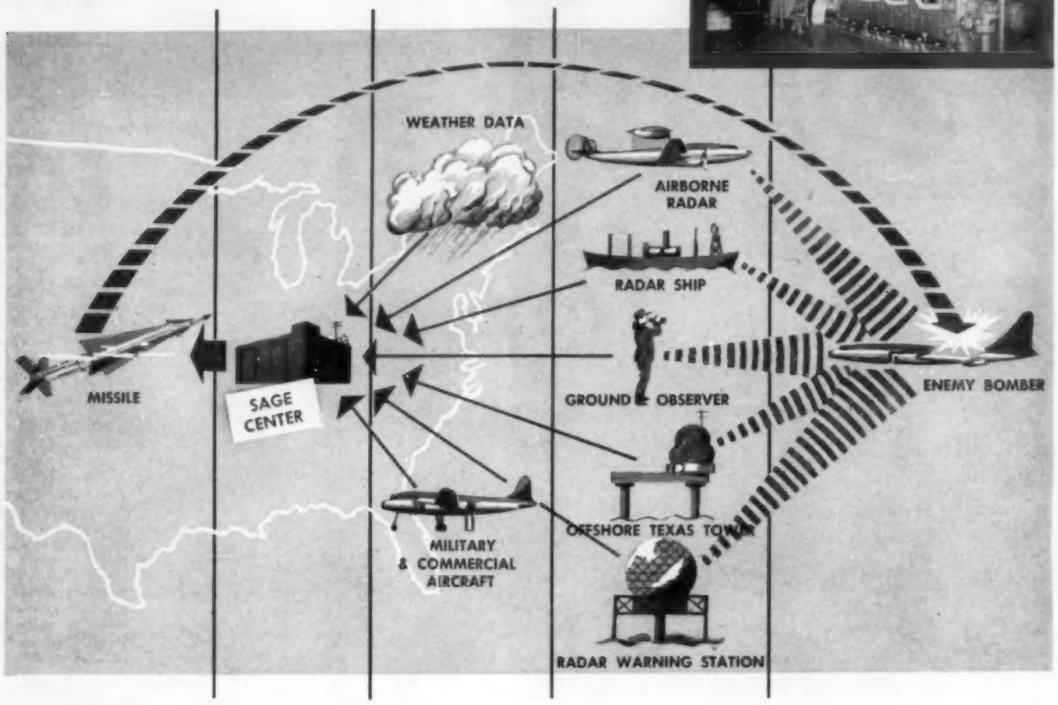

SAGE system can stop enemy bombers!

A marvelous mechanical memory called SAGE (Semi-Automatic Ground Environment) will defend U.S. in event of air war. Sensitive components of this pushbutton electronic system are being installed at key military bases in the U.S. Into these defense centers, from many sources, pour thousands of scattered facts about continental aerial activity—to be collected, sorted and memorized by SAGE. In peacetime, SAGE tracks thousands of scheduled daily plane flights over North America. If war comes, SAGE can quickly identify strange planes as enemy; calculate their speed, range and direction; decide which U.S. interceptors or guided missiles are best located to make the kill, and guide them to the enemy.

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THE WHITE MOTOR COMPANY

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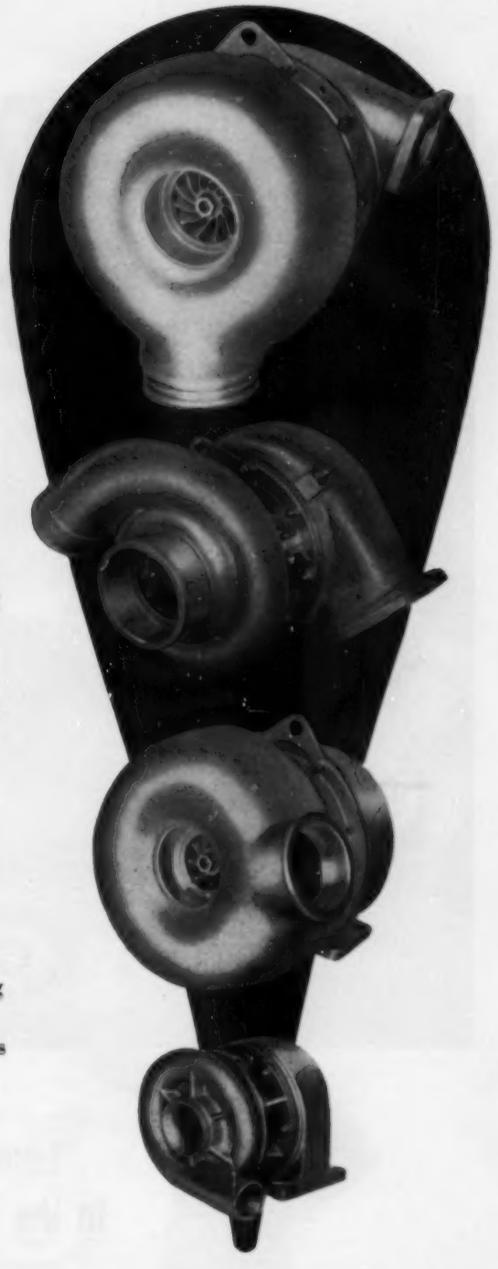

increased power?

Your engine's output can be raised up to 100%, depending on its design and application. Incorporating the most efficient turbine wheels in the industry, AiResearch turbochargers can give sea-level performance up to 12,000 feet.

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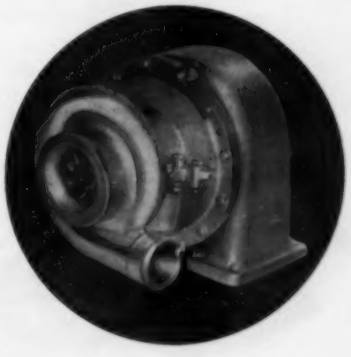
Your inquiries are invited.



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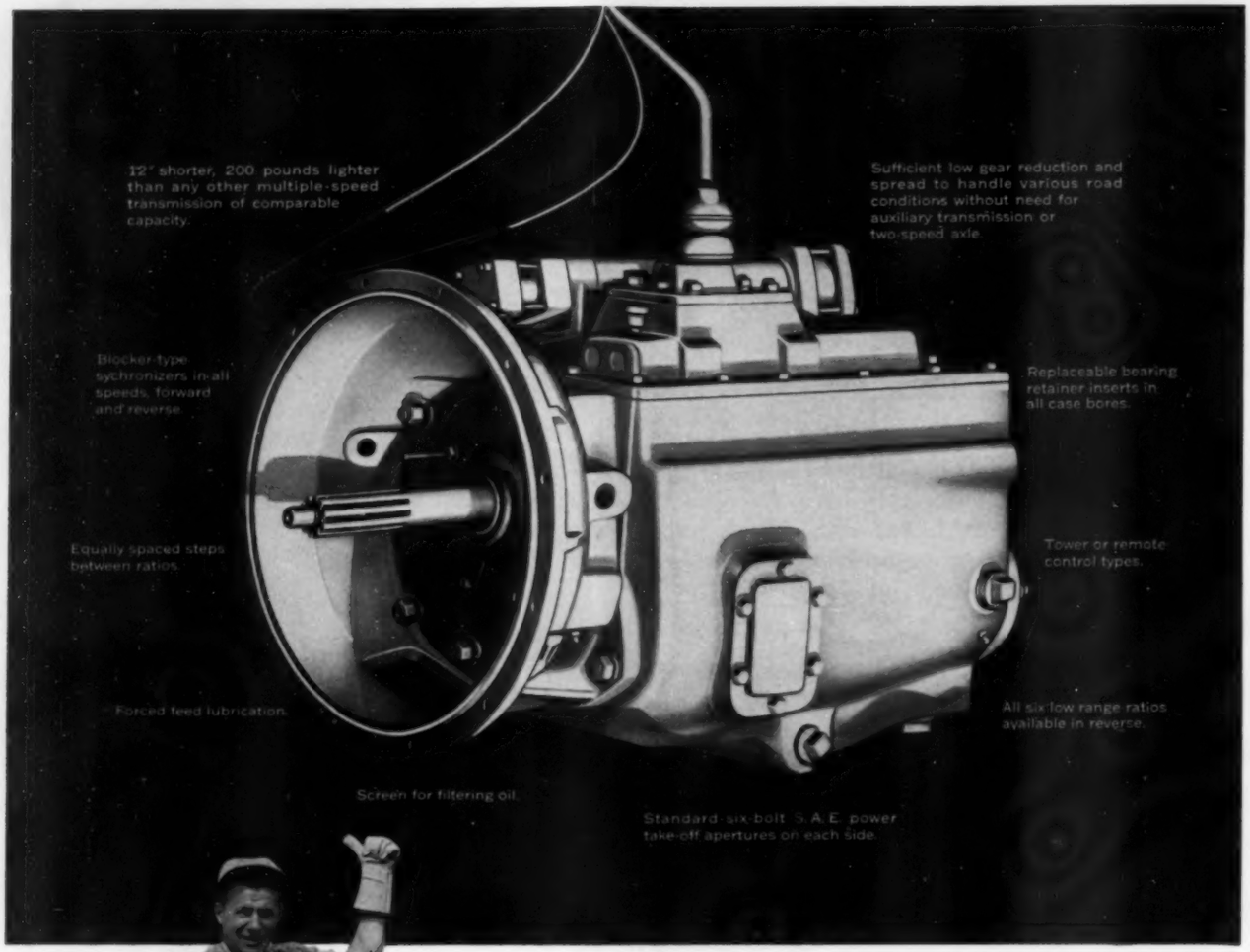
12" shorter, 200 pounds lighter than any other multiple-speed transmission of comparable capacity.
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Very often, due to the addition of latest improvements, your rebuilt unit will outperform the same governor when it was new. A new governor guarantee covers work done in our plants.

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While your engine is shut down for other work, send the governor to our Rockford, Illinois, plant. List the governor serial number on your purchase order and make sure your company name is on the crate. Give shipping instructions and be sure to tell us when you want it back.

2. GOVERNOR EXCHANGE
Tell us when you intend to make the installation. We'll ship a governor like yours but with all the latest improvements. You can quickly install the new unit. Send the old governor to us. The cost — round trip shipping plus time and material to overhaul your old governor for our exchange stock.

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For real emergencies we'll send a man to your plant, with a governor if necessary. Our fleet of airplanes is ready to rush men and material to cope with the situation. Rare but very real emergencies usually can be handled in one day or less.

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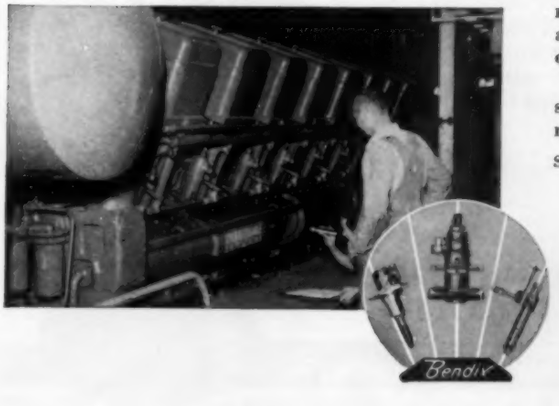

When the sixteen-year-old dredge "Port Arthur" was modernized with the installation of a new 2800-h.p. Nordberg Supairthermal® V type Diesel with Bendix® fuel injection equipment, a number of very amazing results occurred.

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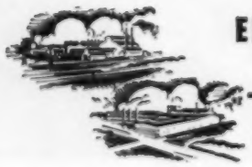
Tensile Strength	95,000# P.S.I.
Yield Point	70,000# P.S.I.
Elongation	20%
Reduction of Area	45%

Close supervision followed through the machining operations where experienced craftsmen reduced the 240,000 lb. ingot to 93,334 lbs. of "Watchmaker's" Precision . . . From raw materials to finished product "Under One Responsibility and One Control". Your steel forging and steel casting requirements will receive the same careful quality control here . . . and your nearest Erie Forge & Steel field engineer will be calling on you soon.

AMERICA AND STEEL STEEL CENTENNIAL MUST GROW TOGETHER



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The only successful way of getting oil out of the earth is to go down after it—with horsepower. The trick is: how to transmit horsepower efficiently and profitably. And that's where Twin Disc Torque Converters come into the picture.

Twin Disc Torque Converters have been used in almost every type of oilfield equipment application . . . used for increased production . . . used for reduced machinery maintenance . . . used for greater over-all profits. And here are seven good reasons why:

1. Twin Disc Torque Converters (three-stage) offer the highest engine output torque multiplication—up to 6:1 if the load requires it.

2. They eliminate engine lugging and stalling . . . permit engines to work in their most efficient speed range, producing maximum horsepower output whenever required.

3. They match drilling speed to compensate for varying degrees of earth formation hardness . . . for highest drilling efficiency.

4. They permit holding and controlling loads such as drill pipe simply through throttle manipulation . . . for greater accuracy in delicate operations and greater all-round safety.

5. They give mud pumps a new degree of flexibility. While engines operate at constant speed, torque converters permit pumps to operate at varying speeds according to load demands . . . to maintain steadier, higher pressures with a minimum of liner changes.

6. They permit more efficient engine operation by improving load balance in applications where engines are compounded.

7. Because of their fluid connection, they dampen out destructive shocks and vibrations between engines and driven equipment . . . for longer lasting machinery life . . . and less downtime for maintenance and parts replacement.

Leading oilfield equipment manufacturers everywhere offer Twin Disc Torque Converters either as standard or optional equipment . . . to provide their customers with these seven profit-making advantages.

Twin Disc Torque Converters are available in both three-stage and single-stage designs . . . to 1000 hp in capacity . . . and therefore Twin Disc engineers can offer completely unbiased recommendations for torque converter applications.

TWIN DISC

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Neodesha packs 1-2 performance punch

1 | *Nordberg Diesels* 2 | *STANODIESEL Oil M*

Operator J. N. Finkinbinder (left) and Everett Powell, Neodesha Superintendent of Electric and Water Plants, adjust rocker arm assembly of Nordberg Duafuel Engine. Engine operated 40,431 hours before overhaul, carrying about 90% of load. All engines in service at Neodesha are Nordberg's. All use Standard Oil's STANODIESEL Oil M.

Finkinbinder and Powell inspect oil filter used for filtering STANODIESEL Oil M used in all six Nordberg Diesels at Neodesha, Kansas, power station.

Quick facts about STANODIESEL OIL M

- Keeps crankcase, pistons, cylinder walls clean.
- Combats deposit and wear problems imposed by using economy fuels.
- Maintains film on difficult to lubricate parts.
- Eliminates spark plug fouling in spark-ignited gas engines and reduces combustion chamber ash and deposits in engines burning natural gas, LPG and liquid fuels.
- Eliminates fuel injector and pump sticking caused by deposits on injector barrel and plunger where fuel and lube oil mix.

The city of Neodesha, Kansas, has six Nordberg engines in service. They have operated more than 400,000 hours on Standard Oil diesel lubricating oils. Here is the case story of one of these engines. The performance of this engine is typical.

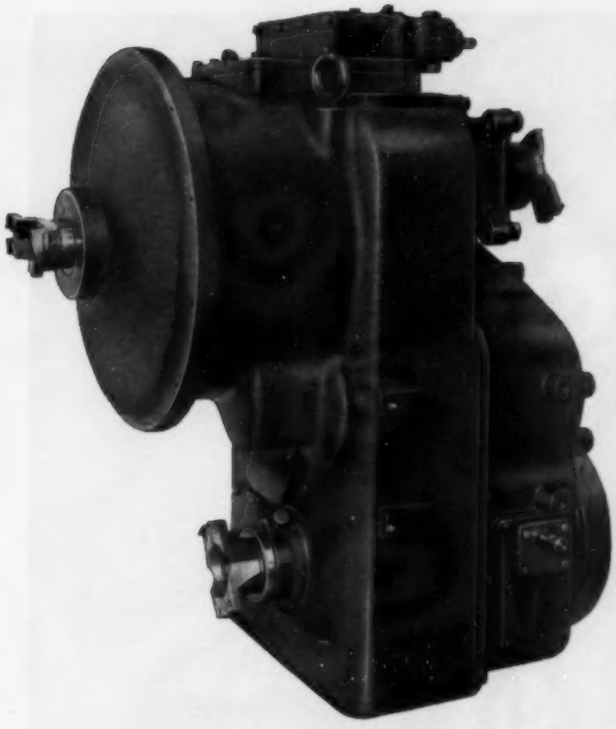
In 1952, the city of Neodesha installed a 1,750 hp., 1230 kw., Nordberg Duafuel engine. During the period between February 14, 1952, when the engine went into service, and March 1, 1956, the engine ran 34,370 hours out of a possible 35,784. This is 96% of the engine's total installed hours. In this time, not even a piston or cylinder head was removed. So good was the performance of this engine using STANDARD HD Oil that when Standard introduced an improved diesel oil—STANODIESEL Oil M—in February, 1955, this engine was converted to this new oil.

There is more to the story. The engine continued in service to 36,223 hours when No. 7 cylinder liner was pulled to put rubber gaskets on liner to stop water leakage. At this time, No. 7 piston and liner were checked. Liner wear averaged only 0.0045 inches. The top ring showed an average wear of 0.016 inches. The No. 2 ring was 0.020 inches. Little, if any, wear was indicated on other rings. Now, at 40,431 hours, the engine is down for overhaul of turbocharger and to have valves ground. Bearings were found in excellent condition. No pistons are to be pulled.

Get more facts about STANODIESEL Oil M by calling the Standard Oil office near you in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 S. Michigan Ave., Chicago 80, Illinois.

STANDARD

STANDARD OIL COMPANY
(Indiana)



ONLY THE WESTINGHOUSE POWER SHIFT TRANSMISSION GIVES YOU ALL 3

1 4 SPEEDS FORWARD, 4 REVERSE

2 COMPACT, INTEGRAL DESIGN

3 500 FT-LBS TORQUE CAPACITY

The new power shift transmission by Westinghouse is designed for use on engine-driven equipment used off the highway where multi-speed operation is required.

Consisting of a torque converter and a power transmission compactly designed in an integral housing, the Westinghouse power shift transmission combines in one package the desirable features of the hydraulic torque converter, fluid coupling and power shift transmission. The entire unit is less bulky, takes less space . . . can be less expensively installed and maintained.

With four speeds forward and reverse, the Westinghouse power shift transmission is ideally suited for vehicles which must travel in both directions during a normal work cycle. Using the simple, rugged counter-shaft principle with constant-mesh gears, field maintenance is reduced to a minimum. The transmission has two ranges, with each range having two speeds, both forward and reverse. (A high range for high vehicle speeds at moderate loads and a low range for low vehicle speeds at heavy loads.)

Simple to operate, a flip of the operator's lever accomplishes power shifts within each range, including forward and reverse . . . and without any interruption of power flow through the transmission and drive.

Automatic feature of the converter and ease of power shifting simplifies operator training and substantially contributes to longer operating life of the equipment. Absence of clutch pedal assures smooth, maximum traction acceleration.

Rated at 500 ft-lbs maximum input torque, the Westinghouse power shift transmission can be used with a wide range of internal combustion engines . . . including the Continental PE-200-1; Cummins HRBB-600, JT-6, JBS-600; General Motors 4-71, 3-71; Hall-Scott 590; Waukesha 140-GZB, 145-GKB, and many others.

J-07363A

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1st gear	6.85
2nd gear	3.43
HIGH RANGE	
3rd gear	2.14
4th gear	1.07

OPTIONAL EQUIPMENT: Direct connection to engine flywheel; convertor tail shaft governor drive; speedometer drive; parking brake.

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Westinghouse

Gulf Marine's new submersible barge is powered by three Electro-Motive 900 hp generator sets. Drive motors are located on rotary, draw works and mud pumps. Barge is shown here under construction at Burton's in Port Arthur. It can drill in water depths up to 30 feet.

Permanent platform rig was put into service in March. It is presently drilling in the East Cameron area in twenty feet of water. Unit has two Electro-Motive 875 hp generator sets with drive motors on rotary, draw works and mud pumps.

NEW COMPANY LAUNCHES TWO RIGS IN ONE YEAR

Gulf Marine uses Electro-Motive Power on both—likes the advantage of "one responsibility"

Gulf Marine Drilling Company of Morgan City, La., is celebrating its second year of business with two new rigs. One, a platform, was put into service in March. The other, a submersible barge, was launched in September.

In discussing why they picked Electro-Motive Power, Gulf Marine placed top importance on these three things: number of rigs using Electro-Motive Power, parts and service facilities available and the fact that one company—Electro-Motive—was responsible for and sole manufacturer of the complete power system.

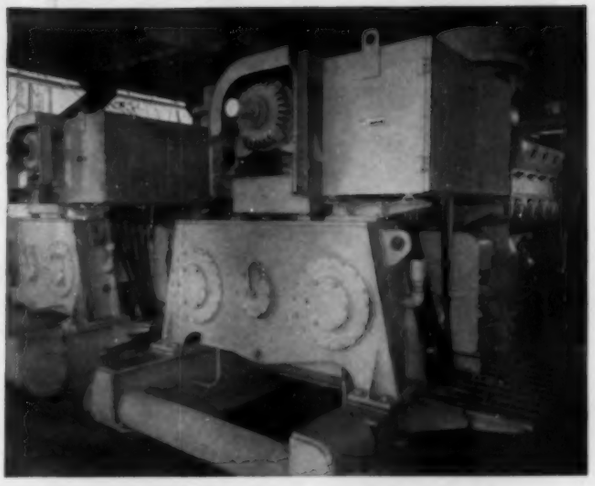
Why is this "one responsibility" important? For one thing, it is assurance that any problems concerning either the engine or electrical components will be handled quickly and satisfactorily—*from one source.*

It means, too, that engine and electrical equipment were designed and manufactured as an integral unit—matched to work better, last longer. It means dealing with only one engineer on installation for the complete power system. And it means one complete facility for all parts and service needs.

Looking at it another way, "one responsibility" is best protection against the extreme cost of downtime. To Gulf Marine with two rigs, the advantages are doubled. Why not ask your Electro-Motive representative about *all* the advantages of Electro-Motive Power?

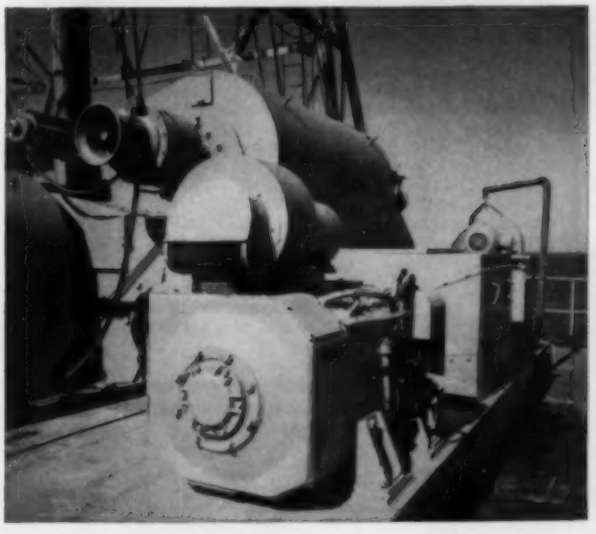
ELECTRO-MOTIVE DIVISION
GENERAL MOTORS · La Grange, Ill.

In Canada: General Motors Diesel Limited, London, Ontario
Petroleum industry sales offices: Dallas and Houston, Texas; Morgan City, Louisiana; Los Angeles, California.



Engine sets on the platform are housed in a shed beside the mast. These two are air-cooled. Engine sets on the barge are keel-cooled.

Two drive motors of 675 hp each power the draw works on Gulf Marine's platform. Drive motors and generators on the engine sets are identical except for field windings, a factor that facilitates service and reduces cost.



ENGINEER'S FIELD REPORT

PRODUCT RPM DELO OIL

FIRM M. M. SUNDT CONSTRUCTION CO. Tucson, Arizona

RPM DELO OIL ends 5 years of engine troubles

The pan has never been off the Caterpillar D7 engine of this Link-Belt Speeder shovel in 7 years, using RPM DELO Oil. Only repair was a single valve job—no other parts replaced. William Naumann, Sundt's Operations Manager, says, "We tried nine different major brands of oil in five years, trying to lick the frequent breakdowns that slowed our operations. Sometimes, main and rod bearings even froze solid on the crankshaft. We changed to RPM DELO Oil seven years ago, and, since then, have never had any engine troubles due to oil failure. We now use RPM DELO Oil exclusively in our 22 heavy-duty engines."

Lubricated with RPM DELO Oil, this Caterpillar D 13000 portable unit powered a rock crusher of M. M. Sundt Construction Co. for a total of 8976 hours before overhaul. "In spite of extremely dusty conditions the only time the engine was touched was to replace a head—no other repairs were necessary," reports master mechanic Billy Gray, shown replacing air cleaner on unit following overhaul.

Austin 101 rock crusher, powered by Caterpillar unit described above, works 20 hours a day at firm's materials stockpile outside Tucson. Company works year around on road paving, grading, foundations, building construction.

Why RPM DELO Oils reduce wear —prolong engine life

● Oil stays on engine parts—hot or cold, running or idle ● Anti-oxidant resists lacquer formation ● Detergent keeps parts clean ● Special compounds prevent corrosion of bearings ● Inhibitor resists crankcase foaming

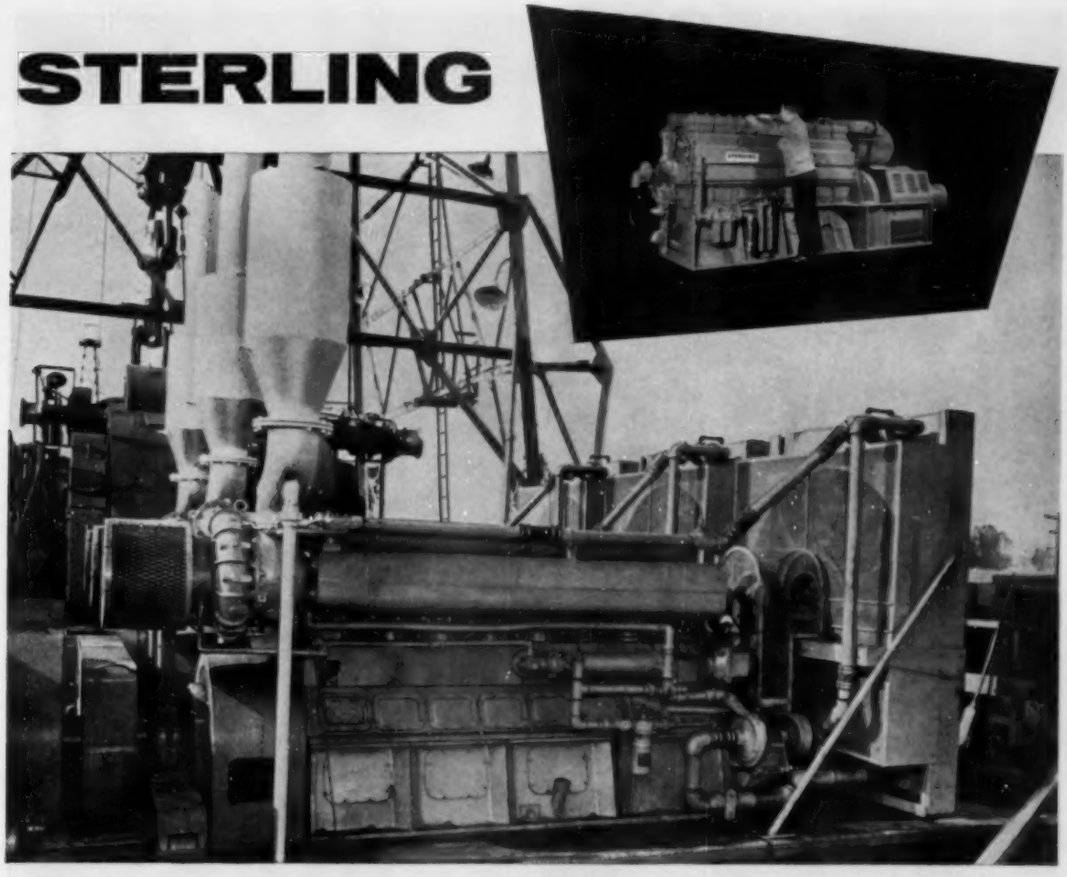
LUBRICATING OILS RPM DELO

For More Information or the name of your nearest distributor, write or call any of the companies listed.

TRADEMARK "RPM DELO" AND DESIGN REG. U.S. PAT. OFF.

STANDARD OIL COMPANY OF CALIFORNIA, San Francisco 20
THE CALIFORNIA OIL COMPANY, Perth Amboy, New Jersey
STANDARD OIL COMPANY OF TEXAS, El Paso
THE CALIFORNIA COMPANY, Denver 1, Colorado

STERLING



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1 **COMPACT DESIGN**... Saves appreciably on building costs and floor space.

2 **REDUCED WEIGHT**... Saves substantially on installation and foundation costs.

3 **INTEGRAL BED**... Simplifies alignment and saves periodic realignment expense.

4 **PRECISION PARTS**... Save labor costs normally required for hand fitting and shimming.

5 **OPERATING ECONOMY**... Sterling's more efficient medium-speed design cuts fuel and lubricant consumption to the bone. (Actual figures on request.)

6 **STERLING QUALITY**... The Sterling name has always been synonomous with quality materials and construction that hold maintenance expenses to an absolute minimum.

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STERLING ENGINE COMPANY, INC. *Menominee, Michigan*

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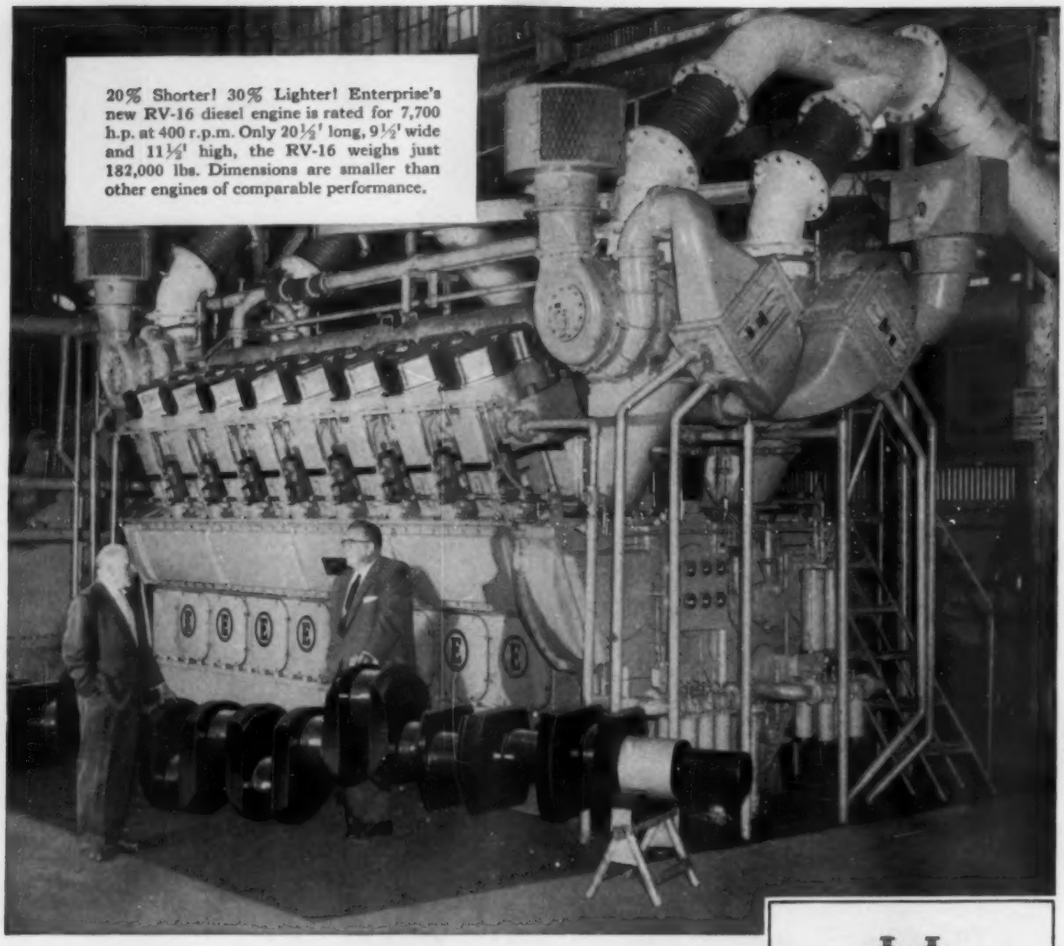
Sterling... used by discriminating engine buyers for more than 55 years.



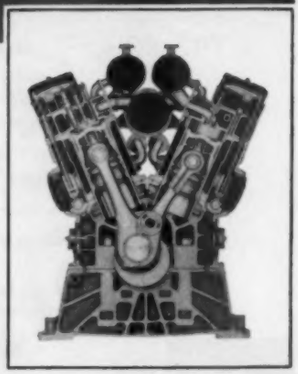
20% Shorter! 30% Lighter! Enterprise's new RV-16 diesel engine is rated for 7,700 h.p. at 400 r.p.m. Only 20½' long, 9½' wide and 11½' high, the RV-16 weighs just 182,000 lbs. Dimensions are smaller than other engines of comparable performance.

Enterprise Chooses KOPPERS Piston Rings Exclusively for RV-16

Prototype of a new line of industrial diesel engines, the RV-16, built by Enterprise Engine & Machinery Co., of San Francisco, is designed for such rugged operations as delivering main propulsion in towboats and seagoing freighters, or supplying power for pumping stations or electric generation.

As many other leading manufacturers have done, Enterprise has selected Koppers Piston Rings exclusively. Koppers wide range of types and sizes . . . variety of material selection . . . control of material quality . . . close tolerance performance . . . rigid standards of inspection—all contribute to Koppers leadership in the field of industrial piston and sealing rings, making Koppers the most dependable source of supply.

If you have a problem of ring application, avoid further needless expense. Take advantage of Koppers experience, research facilities and craftsmanship. Write for information today. KOPPERS COMPANY, INC., Piston Ring and Seal Department, 1412 Hamburg Street, Baltimore 3, Maryland.



Cutaway shows internal design of the RV-16

KOPPERS

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Engines for this fast new fireboat are protected by Purolator filters

Diesels on Baltimore's powerful new fireboat easily push it along at a snappy 17 mph while it discharges 12,000 gallons of water every minute. But if dirt brought in by even the cleanest fuel supply should ever get into the engines, this outstanding speed and power would quickly suffer . . . and expensive repairs would follow. That's why Purolator fuel and by-pass lube filters are included as original equipment on all engines in the ship.

It pays for you to use Purolator filters in your diesel lube systems, fuel lines and fuel injection system. And you can't improve on Purolator Micronic® filtration because the micronic element is made of plastic-impregnated cellulose which makes it waterproof, warp-proof and unaffected by engine temperatures or crankcase dilution. It filters particles so small they can be measured only in microns – .000039 inch.

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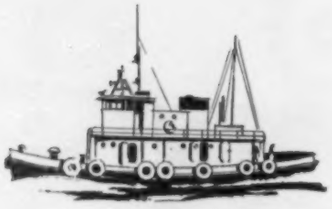
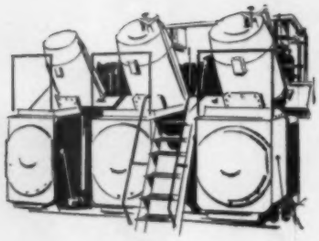
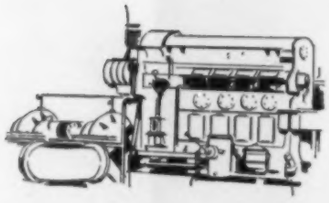


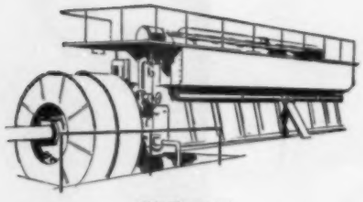
Marine



Engine compressor



Pumping



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FLORIDA'S FLOOD CONTROL STATION NO. 9

In Our May, 1953 Issue, We Published The Original Story Of This Flood Control Operation, Featuring At That Time Station 5-A. Now We Bring You Details Of Station No. 9, West And North Of Miami.

By ED DENNIS

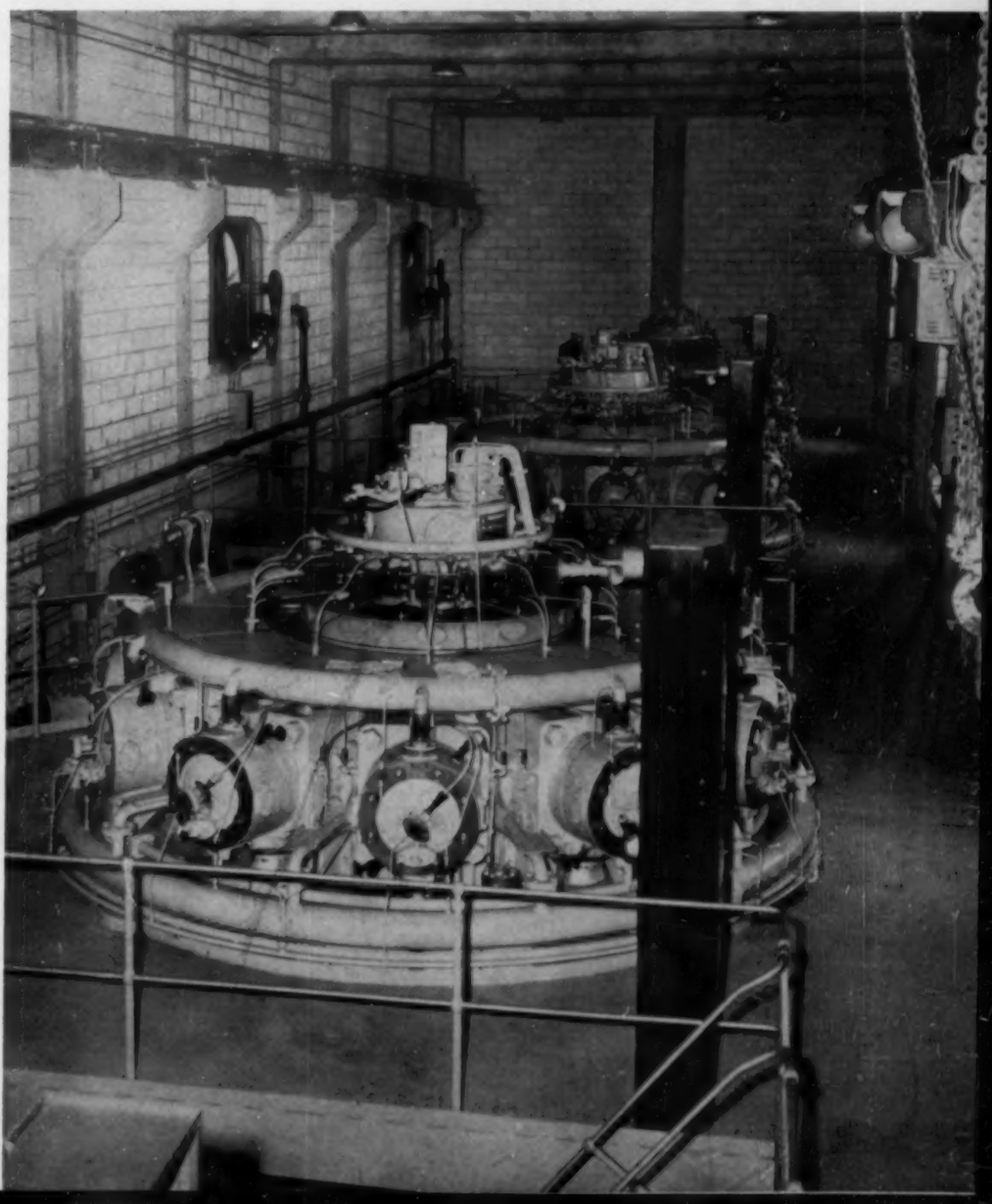
A FEW minutes after you pass the city limits of Hialeah on the western fringe of "Florida's Gold Coast" you are in the Everglades, "a sea of grass and water", where the alligators out number the people. And years ago, the old timers said "it will always be a swampland, man can't control nature". Twenty miles further on you reach Pump Station #9, located in the levee between the Everglades Conservation Area and the Davie Agricultural Area on the South New River canal. The new station houses three Nordberg vertical shaft axial-flow type pumps. Each of the three pumping units has a rated capacity of 960 cubic feet per second at 10.4 foot static head giving a combined output of nearly two billion gallons per day, or enough water to supply the normal needs of every man, woman and child in six states, each with a population equal to that of Florida. Each of the three pumps driven by a 1655 bhp Nordberg radial type diesel engine. Diesel engines for these pumping stations were chosen because of their reliability, since one of the most critical times for continuous pump operations would be when hurricanes and their heavy rain laden winds sweep the area disrupting electric lines and stopping any electrically driven pumps.

This recently activated pumping station is one in the overall plan which will ultimately contain a total of 30 pumping units all with a discharge characteristic similar to this installation. The overall project will cost about 300 million dollars when completed in a few years. The master plan for this tremendous project, that will protect Florida from fire, rain, drought, hurricanes and salt water encroachment, was evolved at the Jacksonville District Office of the U. S. Army Corps of Engineers. Called the Central and Southern Florida Flood Control Project, this unique attack on the State's water problems combines Federal and State's efforts through the U. S. Corps of Engineers under Congress and the Central and Southern Florida Flood Control District, a public corporation established by the Florida Legislature. The natural topography of Florida presents so little hydraulic gradient that these huge pumps are necessary to remove direct rainfall, which often exceeds six inches in a day, rapidly enough to prevent damage to the winter vegetable crop.

Throughout this vast area, water is the element, that can give either prosperity or ruination to the farmer, there's plenty of it and most of it at the wrong time. Because of the record breaking rains which deluged this sunshine state the latter part of 1957, the Central and Southern Florida Flood Control Project is getting its first real trial run and from all reports it is more than holding its own. And if we have a hurricane in 1957, the intricate system of canals, levees, and pump stations, which were designed to avoid a repeat of the wide spread 1947 floods, will be able to take care of the 10 or 12 inch rains which may accompany it.

Prehistoric Indians dug the first canals in this swampland, but the first real proposal to drain these overflowed lands was made by Senator J. D. Westcott in 1847, two years after the state was admitted to the Union. The Florida Everglades, which sprawls over an area of 4000 or more square miles, has stirred man's imagination and defied his efforts of conquest. Flood control work really got its first start in 1881 when some construction was started under an agreement between the State and private interests. The Everglades Drainage District began work in 1907 on more than 400 miles of canals and this overall project was nothing new to the Army Engineers, who had successfully erected dikes around Lake Okeechobee in the 1930's.

The three Nordberg radial diesels driving the huge Nordberg pumps at Station No. 9. Note Marquette governors on top of engine; Manzel lubricator to left; and Bosch fuel equipment for each cylinder. There is an Alnor pyrometer on each control panel and a Nugent fuel oil filter on each engine.



These dikes and levees were constructed after hurricane winds lashed the waters of the lake out and over its banks drowning over 500 persons in 1926, two years later the second tragedy, hurricane winds again whipped the waters of this killer lake out of its bounds drowning over 2000 persons. The third tragedy occured in 1947 when the author saw this wild water go on another rampage and destroy over 60 million dollars worth of property on the farms and in 20 Gold Coast cities. Construction on the project to tame these waters began in January 1950 with the raising of the dikes around Lake Okeechobee to form a water storage basin. At the same time the construction of a chain of levees, dams, locks, pumping stations and canals began so that flood waters could be stored during the rainy season and released when needed during the dry season or during periods of drought, thus assuring the whole area of a water supply, under control at all times, and adequate for all needs.

One of the keys, to the 17 county flood control success in protecting the Gold Coast cities and the rich organic muck farm lands to the south of Lake Okeechobee, is the three mammoth conservation or water storage areas which stretch some 60 miles from West Palm Beach to Western Dade County. These areas composed of about 400 sq mi are scheduled for development as a mecca for game and wildlife enthusiasts. One of the most important steps to be taken was the building of levees around the eastern perimeter of the conservation areas to protect coastal cities and of the erection of control structures to prevent over drainage on the one side and salt water encroachment on the other. Much of this work has been accomplished by completing the enclosure of the rich agricultural area immediately south of and southeast of Lake Okeechobee. When the southern section has been completed, work will move up to the Kissemmee and St. Johns Rivers basins. Since the Kissemmee is the principal tributary into Lake Okeechobee, it is natural to assume that the channel will have to be deepened and the banks raised to accommodate the additional waters that will come. The plan also envisions use of the chain of lakes which serves as the rivers headwaters, as a series of storage reservoirs.

The dikes around Lake Okeechobee were built mostly of rock and marl excavated from beneath the peat soils and average about 70 feet wide. To combat wave erosion the inner walls of the dikes around this killer lake will be surfaced with macadam. For additional protection there will be the construction of dieselized pumping stations and hurricane gate structures built right into the lake dike system. In the areas of St. Lucie River, North Fork, Lake Isokopoga, Fisheating Creek and Moore Haven-Newhall, plans call for the improvement and extension of existing plus some new facilities, to bring about increased run off and to protect developed lands from flooding from adjoining areas. Virtually the entire southern part of Florida is as flat as a table top and normal grades could not be depended on to move the vast quantities of water involved. Consequently the master plan calls for the construction of a chain of low lifting pump stations capable of moving almost 20 billion gallons of water every 24 hours. The latest notable achievement was the completion of station #S9 a few months ago.

The three Nordberg pumping units are housed in a hurricane proof, steel reinforced concrete structure located on the South New River canal. The pumps were designed and manufactured by Nordberg Manufacturing Co. of Milwaukee and are of the vertical shaft, axial flow type, each having a three bladed propeller of 121.774 inches diameter weighing over five and a half tons, the casing bore is 122.025 inches in diameter. Each of the pumps are driven through three Philadelphia 3.03:1, reduction gears by three model RTS-1411 radial type Nordberg diesel engines. These two cycle diesels have a bore and stroke of 14 in. by 16 in. Each diesel engine has a contract rating of 1655 brake horse power at 400 rpm with a rated brake mean effective pressure 62.3 psi and a piston speed of 1066 ft per sec. These engines are of the port scavenging and port exhaust type. Each cylinder has its own American Bosch fuel oil injection system. The engines are started with compressed air through the air distributor which actuates the starting valves in all cylinders heads.

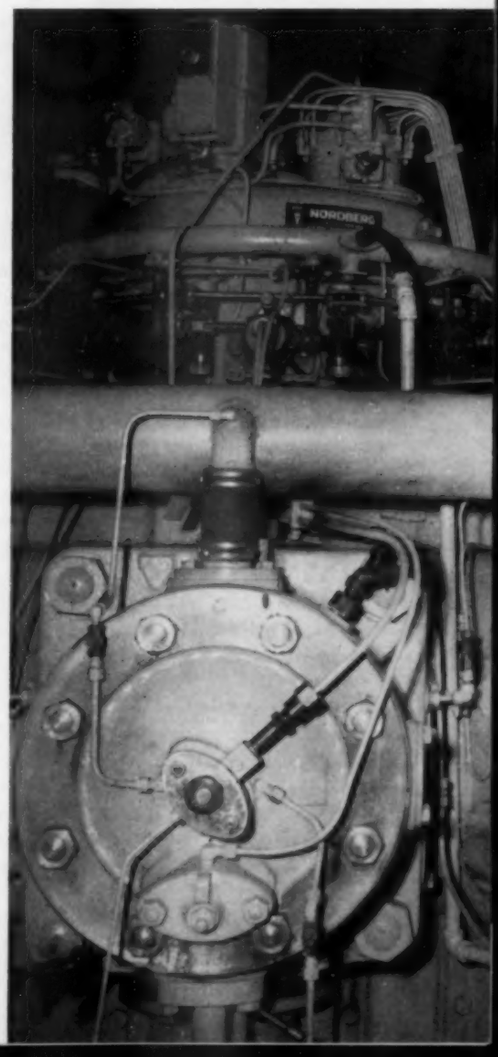
Fuel oil for the main pumping engines, flows by gravity from two 25000 gallon storage tanks to individual motor driven transfer pumps located at the base of the structure beneath the engines through duplex filters to day tanks. From each day tank a booster pump takes it to another filter, thence to the fuel header on each engine. The fuel booster pump keeps a pressure of 20 lbs on the fuel header at all times and has a relief valve to send excess fuel into the return line to the day tank. The fuel oil consumption for the main engines was 50.22 gals. per engine hour during the month of August. Cities Service #3 fuel oil is being used. The lubricating oil pressure is maintained at 35 lbs. Within the system are such accessories as a Hoffman cartridge filter, Elliott twin strainers and a 14 in. Graham shell and tube cooler. A bypass line at the pressure side of each circulating lube oil pump diverts a small but continuous amount of oil to the Hoffman filter from where it is returned to the oil sump as clean lubricating oil. Pure Oil #30 is used for crankcase lubrication while Pure Oil H. D. #30 is used for lubricating the cylinder walls by means of two Manzel force feed lubricators on each engine.

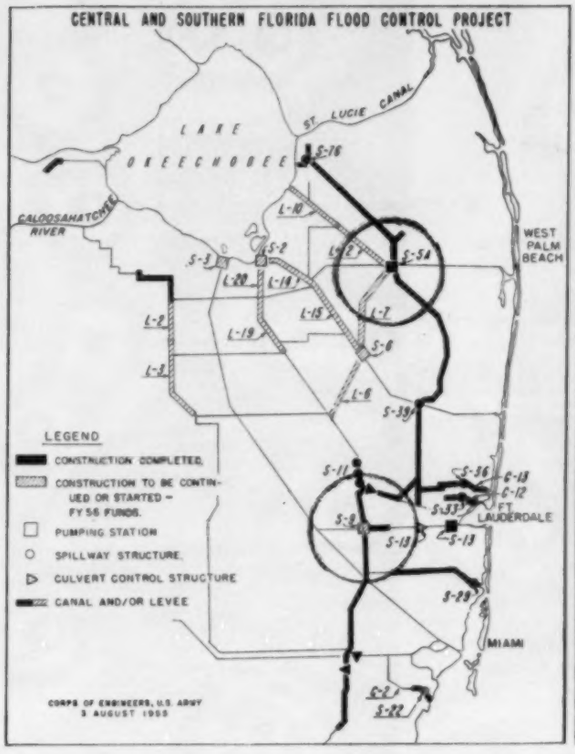
Engine cooling is of the closed type. It includes an expansion tank which is used to maintain a pressure in the system and a 12 inch Graham jacket water cooler. The raw cooling water is pumped from the canal and circulated through the jacket water cooler to cool the engine water. A water softener is only used occasionally. A pair of Fulton Sylphon temperature controls for each engine is also included in the system. Scavenging air for the three main pumping engines is drawn through American Cycoil air filters (two for each engine) that are arranged along the west outside wall above the water discharge bays. Also attached to the same wall, but high enough to avoid interference with the air intake are three vertical Burgess-Manning exhaust snubbers.

Electric power for the station as a whole is supplied by three model 49-T. R-A-6-1 Fairbanks Morse diesel generating sets driving three 93.8 kva Electric Machinery 75 kw, 480 volt 113 amp 3 phase 60 cycle, generators and 1.5 kw Electric Machinery dc exciters. As further precaution and so that this pumping station can get into high gear quickly, the Army Engineers incorporated in the designs, two other diesel auxiliary sets, one a model 48-AG-4¼ two cylinder 1800 rpm Fairbanks Morse diesel to drive a 12.5 Kato ac 60 cycle 127-220 three phase generator to be used for emergency power for the lights and the radio-telephone (KIL-795) which is an intricate part of communication from the headquarters in West Palm Beach to all stations in the flood control project. The other auxiliary diesel is a Powerchief 10 bhp one cyl Nordberg to drive one of the Gardner-Denver air compressors. A 10 hp electric motor provides power for the other Gardner-Denver air compressor.

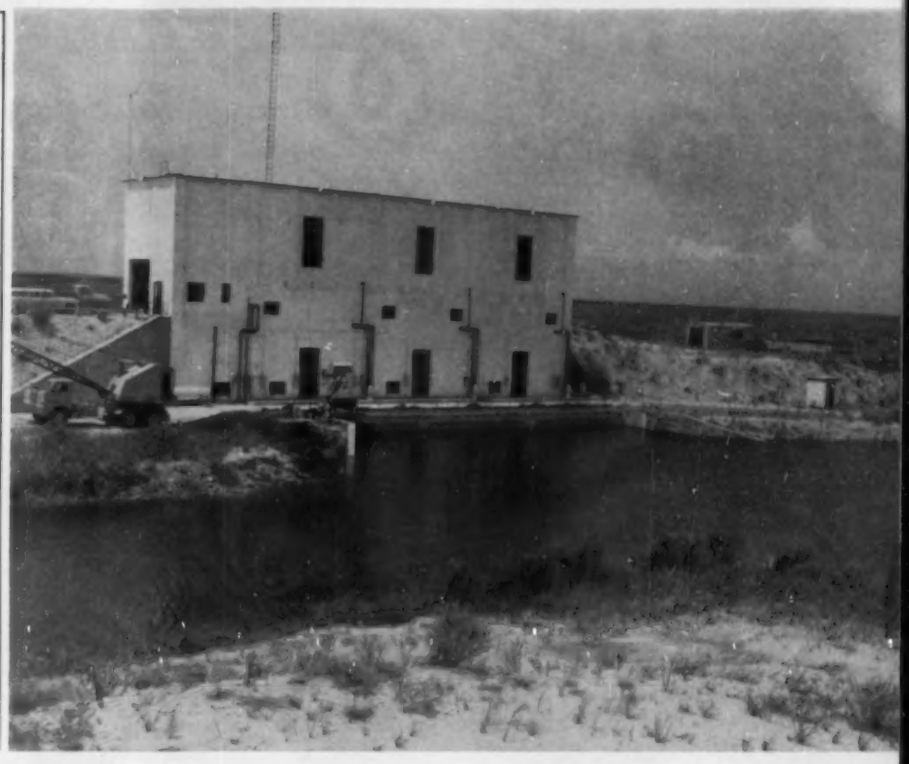
As the pumps, at this station, are self priming, only one vacuum pump was installed as a safety factor. It is a Nash-Hytor size L6 690 rpm 20 in. of mercury and driven by a 30 hp Westinghouse electric motor. The most incontrovertible proof that this project has eased the threat of disaster in the rich Okeechobee area is the way farmers and ranchers have moved into this area and the number of new towns that have sprung up. In 1947 there was a total of 170,000 acres planted in crops or improved pasture and now, less than 10 years later, almost 360,000 acres are in use or are in the planning stage for development. In 1953, flood

Top view of one of the three Nordberg radial diesels at Station No. 9, showing a close-up of the Manzel lubricator to the right, the Marquette governor to the left and the American Bosch fuel equipment.



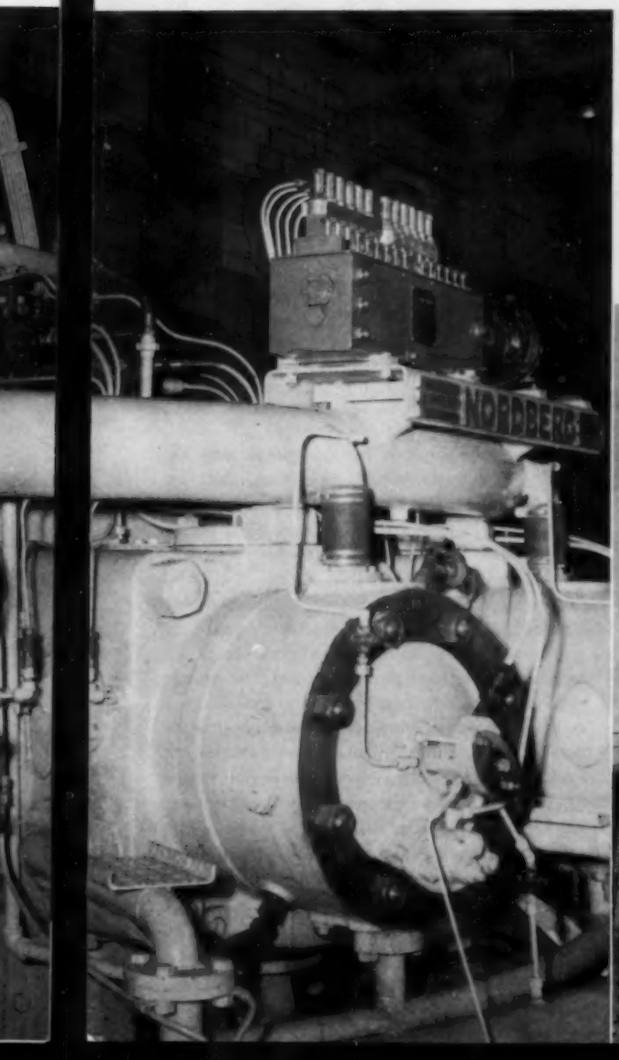


General view of the flood control project with the top circle indicating Station 3-A, which we described in the May, 1955 issue, and the lower circle indicates location of Station No. 9 which is described in this article.



General exterior view of the pumping Station No. 9, the Central and Southern Florida Flood Control Project. This is, of course, the water intake side.

conditions could have turned the fabulously wealthy "Gold Coast" into a dismal "ghost coast" had not the 130 mile levee, which protects this area, been completed the year before. The rampaging waters were diverted into the water storage area bringing a great sigh of relief. And as further proof benefits are expected to total $4.17 for each dollar spent on this project. The author, who happened to be one of the 1947 flood victims, flew over this vast area of the "glades" recently and was amazed at the tremendous progress in so short a time. He also wishes to express his sincere thanks to Mr. Edward L. Meyer, Jr., Corps of Engineers U. S. Army at Jacksonville, Florida and to Al Vogt of the Central and Southern Florida Flood Control District for their assistance.



The discharge side of Station No. 9, which well illustrates the 3 Burgess-Manning snubbers for the main engine, and the two smaller Burgess-Manning units for the auxiliary engines. In between the big snubbers, you will note the duplex American Cycoil air filters, a pair to each engine.

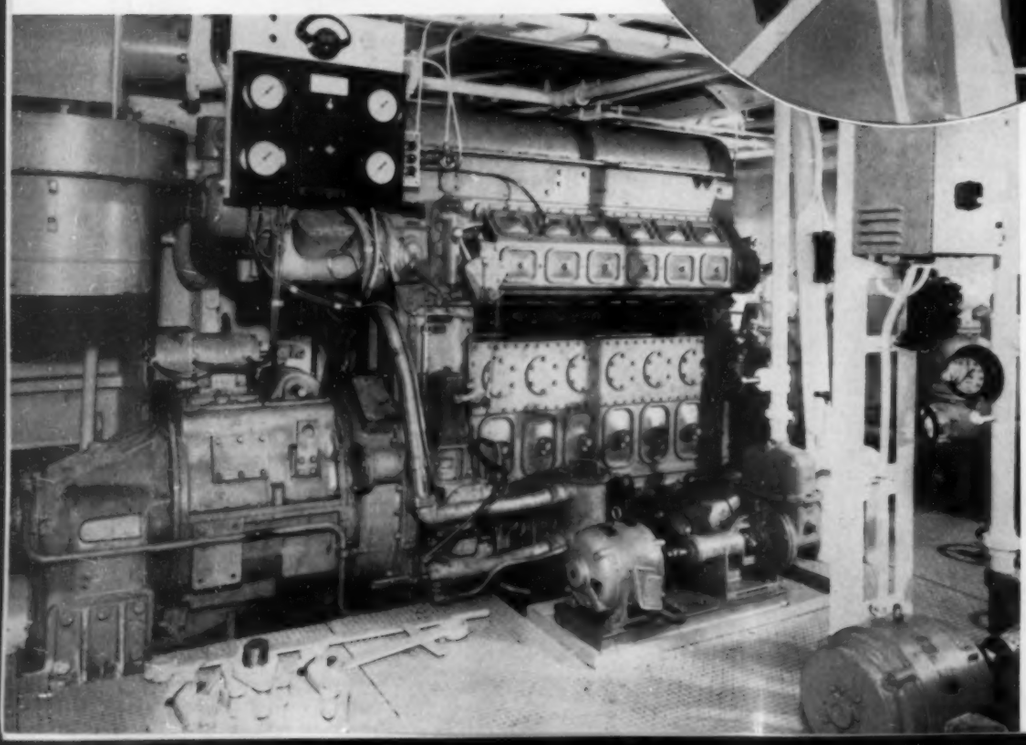
THE M/V *R. B. KELLY*

Multi-purpose Craft Uses F-M Propulsion To Serve Offshore Installations Seeking Oil In Gulf Of Mexico

ROUNDING out two years of arduous service, The Pure Oil Company's M/V *R. B. Kelly* is proving herself as a sturdy, efficient multi-purpose work boat. The 605-ton capacity *R. B. Kelly*, powered by Fairbanks-Morse diesels, is one of the most versatile vessels in the Gulf, meeting the varied needs of offshore installations of The Pure Oil Company seeking oil under Gulf waters. She's designed to serve as cargo ship, supply vessel, tanker, tug boat or operational barge in order to meet her demanding assignments. The 130-foot *Kelly* sails for the Gulf Coast Producing Division of The Pure Oil Co. which has its headquarters in Houston, Texas. The division was activated in 1926 to explore for and produce oil, gas and condensate in areas adjoining the Gulf of Mexico. Operations have been extended into the Gulf. The *Kelly*, named after Raymond B. Kelly, Pure Oil vice president, was christened in June, 1955. At that time she was the largest ship and with the greatest cargo capacity of any similar ship under U. S. Coast Guard limitation of 300 tons.

With her 35-foot beam, the 297-ton vessel has a light draft of 5.6 feet, a 7.6 foot draft under normal load and a maximum draft of 8.6 feet. The *Kelly* can carry cumbersome marine drilling equipment on her decks and liquid in her cargo tanks below. She's got the power and drive to make her ideally suited for towing. She can be equipped to handle hoisting and other operational work at offshore platforms to relieve larger derrick barges for other work. In her holds and topside, she can stock a wide assortment of supplies needed by the offshore drillers. The *R. B. Kelly* is powered by two, 6-cylinder 38F5¼ Fairbanks-Morse opposed-piston diesel engines, each rated at 450 hp at 1200 rpm. Together, the engines afford a line pull of 25,000 lbs. The compact, lightweight engines have a bore and stroke of 5¼" x 7¼". Driving her through the water are two 42-inch pitch by 62-inch diameter propellers turned by the diesels through Snow-Nabstedt reduction gears at 400 rpm.

This functional ship incorporates many features of the LCTs and self-propelled barges of World War II, but is stronger, more adaptable and has more cargo space. Her split deckhouse, similar to the LCTs, permits unobstructed deck cargo space more than 110 feet in length for handling bulky, offshore oil equipment. She has a wider than normal hull which permits additional cargo space and provides for stability in crane operations. This, plus her rounded bilges, tends to reduce pounding when underway. The wider hull also makes for easy navigation in shallow waters. Her open, unencumbered stern allows loading cargoes of many types direct from trucks without the need of heavy duty cranes or slings. In some cases, entire truckloads of marine drilling equipment can be driven directly on deck for unloading. The durable *Kelly* can carry 10,000 feet of drill stem at a single loading. The weather deck provides, through additional reinforcing, necessary strength to carry a 65-ton



One of the two, 6-cylinder Fairbanks-Morse O-P diesel engines which can drive *Kelly* at maximum speed of 12½ knots. Each engine is rated at 450 hp at 1200 rpm, and together generate a line pull of 25,000 lbs. These compact, lightweight, heavy-duty engines have a bore and stroke of 5¼" x 7¼" and are equipped with Snow-Nabstedt reverse and reduction gears.

Forward view of the pilothouse with John Graham in the foreground. Mr. Graham is a partner in the firm of Christenson & Graham, Pasadena, Texas, naval architects who designed the M/V *R. B. Kelly*.

The *R. B. Kelly*, multi-purpose craft with a 605-ton cargo capacity, plies the Gulf of Mexico to serve offshore installations of The Pure Oil Company drilling for oil in the vast reservoirs beneath the waters. She incorporates many features of the LCTs and self-propelled barges of World War II, but she's more powerful, more adaptable and possesses more cargo space.

crawler crane, which is used at offshore platforms in hoisting operations. Her cargo can be as varied as weather in the Gulf. Topside, she may carry trucks for cement, logging and perforating uses; large quantities of structural steel, mud, cement, drill pipe, tubing and other items essential in offshore oil drilling. Flush tricing-down pads, stanchion sockets and heavily constructed 48-inch high bulkwarks running the full length of the ship, both starboard and port, are provided for retaining and tricing down cargo and for preventing the shifting of cargo in heavy weather.

Below decks, the *Kelly* has six cargo tanks with a capacity of 3,300 barrels which normally contain drilling water. The tanks can be used, however, to move liquids from marine drilling platform storage tanks to the mainland. Two wing bunkers in the engine room provide 6,000 gallons of diesel fuel storage. The vessel also carries 3,000 gallons of potable water for transfer to offshore operations. Two main cargo pumps, one electrically driven and one driven by a power take-off from the starboard main engine, can completely discharge all cargo from the tanks within two hours. After discharge, tanks can be ballasted with sea water to provide sea-keeping quality when necessary in rough weather. The pilothouse, located on the starboard side of the split deckhouse, is fitted with Kearfott windows and windshield wipers, Constellation compass, Raytheon radar, Morse throttle controls, Westinghouse reverse gear control and Sperry rudder control. Both rudders are about 50 percent larger than normally required. The vessel has a Carlisle & Finch searchlight and carries two Danforth bow anchors handled by a Dake 7.5 hp, two-speed winch which also can be used for loading and unloading purposes. The *Kelly* can accommodate a crew of six.

The *Kelly* is the result of planning initiated in 1954 by Gulf Coast Producing Division engineers. Their objective: to find more economical and safer equipment to provide for material handling and transportation of cargoes necessary in offshore drilling operations. After extensive study of the requirements for this equipment, basic design criteria were assembled. To properly apply these design criteria to sound marine design, the naval architectural firm of Christenson & Graham, Inc., was engaged to work with Gulf Coast engineers. After months of study, engineering design work and model tests, a contract was let to the shipbuilding division of Equitable Equipment Company for construction of the *Kelly* in their yards at Madisonville, La. Building started in January, 1955, and was completed on June 1st that year. When offshore oil drilling first looked promising, a variety of vessels were tried in the work by Gulf Coast. Included were barges, tugs, fishing vessels, surplus Army and Navy craft, and other types of available marine transportation. Most of the surplus Army and Navy vessels were too lightly built for this service. Fishing vessels and other sturdier Navy vessels such as YMS were not designed to carry much cargo. Barges were hard to handle and proved dangerous in rough weather. None was satisfactory, and thus the search for a ship to meet all requirements was begun, and the *Kelly* was the result. The functional, rugged *Kelly*, with her ample cargo space and powerful F-M engines, is living up to the description of Captain Neville Levy, Equitable Equipment Company president, who calls her "one of the most flexible pieces of floating equipment ever built."

DIESELS SUPPORT JETS

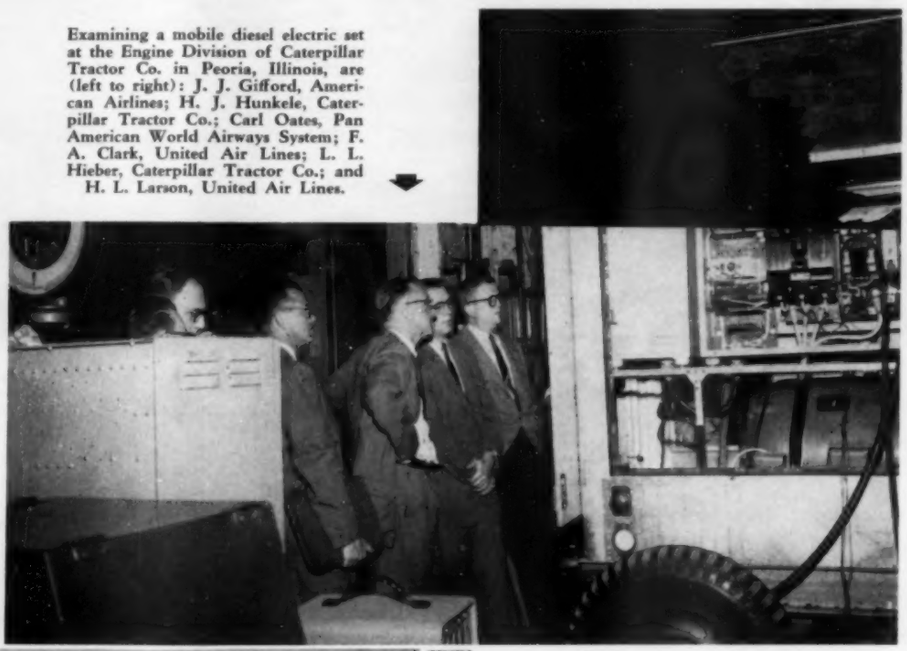
PLANNING for smooth and efficient commercial jet aircraft ground support operations is well underway. Airline officials attending the Air Transport Association of America's Meeting on Ground Support Equipment in Chicago heard suggestions of methods for handling jet aircraft weighing in excess of 100 tons. Nine of the Association's delegates visited Peoria, Illinois, to view proposed ground support equipment which included both tow tractors and mobile power units. At the Chicago portion of this program, speaking before the Association's meeting in the Hotel Sherman May 1, H. D. Clark, Caterpillar Tractor Co. representative, told delegates that his company has considerable interest in providing ground support equipment capable of handling the largest jet airliners.

"As the airlines have grown in recent years," the Caterpillar spokesman told the Air Transport Association assembly, "your ground support equipment power requirements have also grown, and as you go into the era of large jet transports, you will have the need for the type and size equipment which we build." Mr. Clark said excessive fuel consumption in taxiing can be cut by towing aircraft between the hangar areas and the passenger ramp since this operation usually does not involve a highly critical number of minutes and can be done over a route where the normal flow of ground traffic is not seriously restricted. Caterpillar Tractor Co. is in the business of making tractors which can handle a 250,000 lb airplane with relative ease and at moderate speeds.

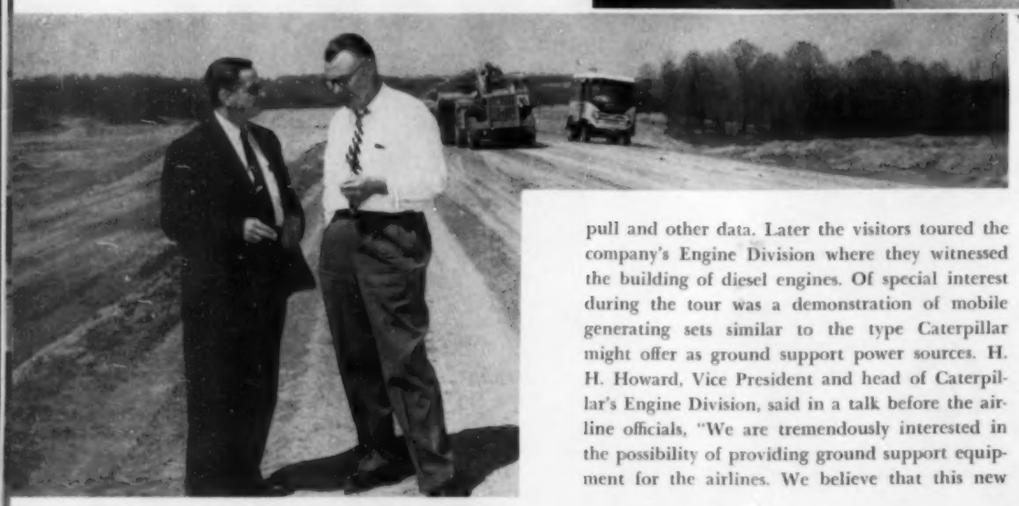
In suggesting the type tractor which would adequately serve the ground handling of aircraft the size of the Boeing 707 or Douglas DC8, Clark mentioned the Cat DW15, a 200 hp rubber tired tractor used presently as an off-highway prime mover in construction and other equally demanding jobs. According to the Caterpillar spokesman, only minor modification would be necessary to adapt this machine to serve the purposes of jet airliner ground support handling. Although the DW15 is not the largest or most powerful rubber tired tractor built by Caterpillar, he indicated that the airlines would not be justified in having a larger size since the DW15 is completely capable of doing the job.

Since the DW15's diesel engine can operate satisfactorily on JP-4 jet fuel, supply problems for this tractor would be minimized. Clark stated that a tractor of this type costs about $25,000-$30,000, depending upon the modifications and the amount of special equipment which is required for specific contract delivery. Suggested modifications would include such items as fire extinguishers, front and rear hitches, towing winch, extra seat, generator set and storage compartments.

At Caterpillar's Research Proving Grounds, Peoria, Ill., the visitors saw the Cat DW15 Tractor pull loads designed to simulate the towing of mammoth aircraft. The visiting officials rode alongside the DW15 in a special instrument vehicle viewing electronic gauges which recorded the amount of pull and other data. Later the visitors toured the company's Engine Division where they witnessed the building of diesel engines. Of special interest during the tour was a demonstration of mobile generating sets similar to the type Caterpillar might offer as ground support power sources. H. H. Howard, Vice President and head of Caterpillar's Engine Division, said in a talk before the airline officials, "We are tremendously interested in the possibility of providing ground support equipment for the airlines. We believe that this new field is directly related to the course in which our present machine activities are heading." Randall Roman, the Chief Engineer of the Engine Division, reviewed the difference between diesel engines and gasoline engines and the advantages to be expected from the use of a diesel engine. These included dependability, economy of operation and ability to burn the same fuel as used in the jet aircraft. These same advantages would be obtained whether the engine was driving a diesel electric set or tow tractor. Len Hieber, Project Engineer, reviewed the expected frequency and voltage performance using several combinations of voltage regulators and governors. He also reviewed the instrumentation which must be used in order to determine the response specified in most specifications. From the Engine Division the group traveled to the Greater Peoria Airport where the visitors saw a demonstration of the speed, maneuverability and braking power of the DW15. Each visitor had the opportunity of operating this ten ton tractor.



Examining a mobile diesel electric set at the Engine Division of Caterpillar Tractor Co. in Peoria, Illinois, are (left to right): J. J. Gifford, American Airlines; H. J. Hunkele, Caterpillar Tractor Co.; Carl Oates, Pan American World Airways System; F. A. Clark, United Air Lines; L. L. Hieber, Caterpillar Tractor Co.; and H. L. Larson, United Air Lines.



Jack Stewart, Superintendent of Ground Equipment, Trans-Canada Air Lines, discusses ground support techniques with H. H. Howard, Vice President, Caterpillar Tractor Co., during a demonstration at the Research Proving Grounds near Peoria, Illinois.

Those delegates who visited the Caterpillar plant included W. A. Payton, assistant Jet Projects coordinator, Pan American World Airways System; Carl Oates, Pan American World Airways System; H. A. Petty, former Technical assistant to Superintendent of Maintenance Delta Air Lines Inc. and now Superintendent of Maintenance of Lake Central Airlines; R. H. Nelms, Engineer of Building Maintenance Service Equipment, Eastern Air Lines; F. A. Clark, Superintendent of Ground Equipment United Air Lines; H. L. Larson, Superintendent of

Behind the wheel of a Cat DW15 at the Greater Peoria Airport is J. J. Gifford, American Airlines, being instructed by E. Dehnbostel, Caterpillar Tractor Co. Visiting airline officials operated the big machines as part of a demonstration to show the handling characteristics and capabilities of large tow tractors.

Dynamic Measurements vehicle records test results as DW15 shows its pulling ability. Airline officials rode inside the Measurements vehicle to witness instrument readings. Tests were part of a day-long demonstration of ground support equipment. Machines shown here are operating at the Caterpillar Research Proving Grounds near Peoria, Illinois.

Ground Equipment Engineering, United Air Lines; J. J. Gifford, Senior Buyer, American Airlines; Jack Stewart, Superintendent of Ground Equipment, Trans-Canada Air Lines; Gordon W. McKenzie, Supervisor of Corollary Equipment, Trans World Airlines, Inc.

Attending a demonstration of the Cat DW15 at the Greater Peoria Airport were (left to right): J. Stewart, Trans-Canada Air Lines; H. A. Petty, Delta Air Lines, Inc.; J. J. Gifford, American Airlines; F. A. Clark, United Air Lines; R. H. Nelms, Eastern Air Lines; H. H. Howard, Caterpillar Tractor Co.; H. L. Larson, United Air Lines; Carl Oates, Pan American World Airways System; H. J. Hunkele, Caterpillar Tractor Co.; and W. A. Payton, Pan American World Airways System.

STITCHIN'S FOR BUSTED BRITCHIN'S

Contra Costa County, Bay Back Bedroom, Caught in a Metropolitan Suburban Boom Starts Investing Millions In Modern Roads, Streets, Schools, Business and Home Developments with All the Water, Sewer and Public Utilities.

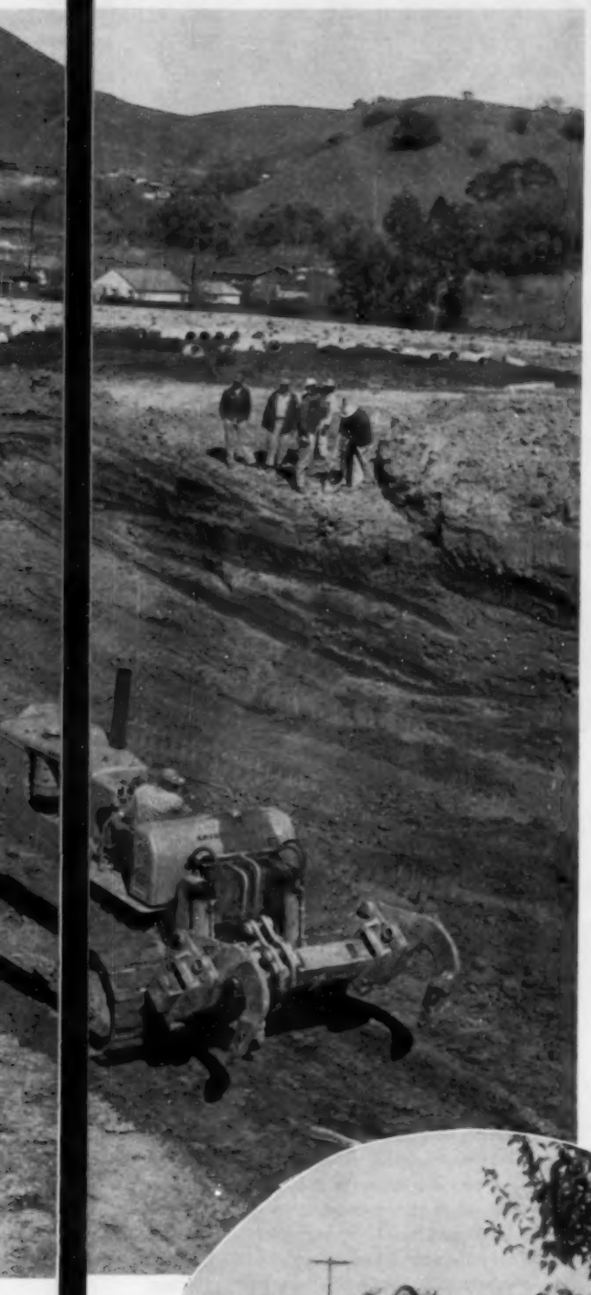
By F. HAL HIGGINS

CONTRA Costa County, California, is typical and still different from dozens of other American areas around the big industrial cities that have been caught in the population rush for the suburban life. Direct access to the homes of much of the county for the daily workers in the San Francisco and Oakland offices, stores and factories is via a single 4-lane tunnel that is a bottleneck that piles up traffic morning and evening with occasional blockades in case of wreck inside or near either end of tunnel. By 1955, the State Highway Department had laid out plans for 14 million dollars in new and modernized highways inside the county to help solve its auto, truck and bus traffic problem. Some of these new freeways are now coming to use and more are starting for completion in another two years. When you get away from the industrial fringe of Contra Costa County on the Bay that makes a big swing from Richmond to Antioch up the Carquinez straits and on to the joining of the Sacramento and San Joaquin rivers, there are a flock of little unincorporated villages and shopping and housing centers. Here we find the big and different problem in that some 150,000 people now live in the Orinda-to-Concord area and only Concord and Walnut Creek are incorporated with governments to cope with problems of drainage, sewer construction, and the public utilities in their areas. Martinez, county seat of Contra Costa, is off the main highways that connect the towns, cities and hamlets with the Bay cities. That makes for more problems of county government.

Schools were the first problem in bringing prewar services up to the needs of the growing postwar population that rushed for the suburban life as the returning soldiers and sailors married and started raising families. So, the writer noted the adding of big wings to schools already established

Taking on a load of dirt from the bed of Walnut Creek. One of two of Oscar Holmes' LeTourneau-Westinghouse scrapers being pushed by one of his fleet of Cat D8's in giving old creek a new and useful look for handling both traffic and water.

Grade separation being cut through under the Tunnel Road from East Bay to Walnut Creek. Cat D9 gets behind a Euclid GM powered. Below-Cat skinner fueling his tractor and getting ready to install Winslow oil conditioner elements in his filter.



and the building of new schools when he arrived in this area less than six years ago. The Parkmead grade school is just over the hill from his office, scarcely a mile away. Most schools were operating in shifts with two different groups of pupils filling the rooms from early in the morning till late in the afternoon. The Orinda Excavating & Paving Co. got the dirt-moving job of cutting down a hill to make it a site for three or four homes while moving the earth down onto the fill and levelling for playgrounds and wing of the new school addition. On this job this firm used both its own and rented equipment operated by small outfits that were just getting started with a few pieces of diesel equipment. These machines were used here and on two other jobs Orinda Excavating & Paving Co. had going at the same time in other areas of the county: 4 DW10 scrapers; 2 Tournapulls with GM engines; 1 Austin-Western 99 grader with International diesel; 1 Cat 12 motor grader; 1 Gallion motor grader with Buda engine; 1 Cat D8 with bulldozer and ripper; 2 Cat D7's; 3 Cat D6's. Rented with operator-owner for help on the school job were two Allis-Chalmers scrapers that were rolled from one school job to another to speed the moving of 25,000 yards of earth in three weeks. This renting of equipment with skilled operators who own it is a big saving for a company to get by without investing in new machines faster than they can be earned on the jobs worked, Orinda Excavating Henry F. Soehner said. Both Soehner and his partner Robert A. Cambria, came out of the Navy at end of their hitch in World War II and immediately joined hands to get into this industry.

Oil field products service is tops with the edge of the county on the Bay having four refineries and tank farms. Distributors of Texaco, Shell, Standard of California, Tidewater Associated, Union, GP and others are located at Walnut Creek, Concord, Pittsburg, Richmond, Antioch for high efficiency in getting any and all greases, fuels and oils to the job for those contractors who do not have their own "grease" wagons to go to the distributor to get their daily loads of needed products. The writer took a ride with Orinda's service manager as he headed for the local Standard distributor, took on a load and then went out to a home development to service the tractors, graders, scrapers, etc., there. One item noted was the stocking of the Winslow oil conditioning elements in both the shop and the service truck that went out to the jobs. "No matter what filters and elements are on the tractors and scrapers when we buy them, Winslow socks are used by us exclusively on our equipment's filters," said Soehner. "We can't say too much for them. We have proved their place on these heavy duty diesel machines and you will find them in all our filters."

It was surprising to note the number of small diesel tractors coming into the area for many uses by public utilities. P.G. & E. recently bought three Ford Major diesels with back-hoes, bulldozers and hydraulic controls. The writer caught one of these on two different days doing two difficult jobs that the big machine didn't fit into as well. First, it was digging a ditch for re-locating a gas line back of old stores that were being torn down to make way for a freeway. Next, it was on the creek bank digging a hole around a gas pipe that had to be cut and plugged next to where a big job of putting Walnut Creek into a concrete straight jacket. Other little jobs by small contractors and owners were seen in a pair of Allis-Chalmers HD 10 and HD 16 scrapers that were excavating for a new business building site and cutting out a bank back of a gas station to enlarge that station. This pair of Allis-Chalmers diesel tractors also did work on the new American Trust Co. bank site excavations on main street in Walnut Creek.

P.G. & E. owns three of these new bluecoated Ford diesel tractors with back-hoe and bull dozer for their many little jobs of digging up and re-planting gas lines, etc. Caught at work as P.G. & E. 2-man crew took care of its lines in getting out of the way of a new freeway coming in here.

Filling for W. C. Sheet Metal Bldg. at Walnut Creek as new freeway cuts through old site on Tunnel Road. LeTourneau - Westinghouse with G.M. engine.

CON EDISON'S MECHANICAL MOLE

Diesel Driven Horizontal Boring Machine Makes Sub-Strata Penetrations 300 ft Long And Up to 36 Inches Diameter in One Setting.

By ARNOLD B. NEWELL

A FOURTEEN ton mechanical mole is performing remarkable feats of boring horizontal holes and lining them with steel pipe in sub strata in the Metropolitan New York area for the Consolidated Edison Company. This G-M diesel driven machine is 12 ft high 4 ft 2 in. wide and 10½ ft long. It rides on tracks 36 ft long and propels a 24 ft section of 16 to 36 in. diameter pipe into the hole it drills, then backs away for insertion of another length. It is referred to as a "power packed giant" by the owners, and is the only one of its kind in existence. It is the most interesting one of three models of borers which insert approximately ten thousand feet of steel pipe yearly in the company's distribution system.

Economic advantages and saving in cost of making the larger steel pipe insertions are difficult to state in terms of dollars and cents because the machine performs feats all but impossible to perform in any other way. Commenting on its operation the owners merely state, "On its maiden run this giant machine was instrumental in saving the company a considerable amount of money over the standard methods of open trench or tunneling." Trenching to lay subterranean power, gas and steam lines involves tearing up streets and disrupting traffic followed by back filling, compacting and re-paving. This can not be done under buildings nor in sub strata to a depth clear of existing installations of other facilities. Trenching across a street, parkway or express highway disrupts traffic and it is therefore a public annoyance which Consolidated Edison strives to prevent. With a boring operation in progress the motoring public is unaware of it. The borer can work from one excavation from intersection to intersection at any predetermined depth, under all surface structures without disturbing overlying foundations. It bores through all forms of terrain including solid rock. The machine can bore under railroad tracks at embankments or from a pit without causing train slow-down in the work area.

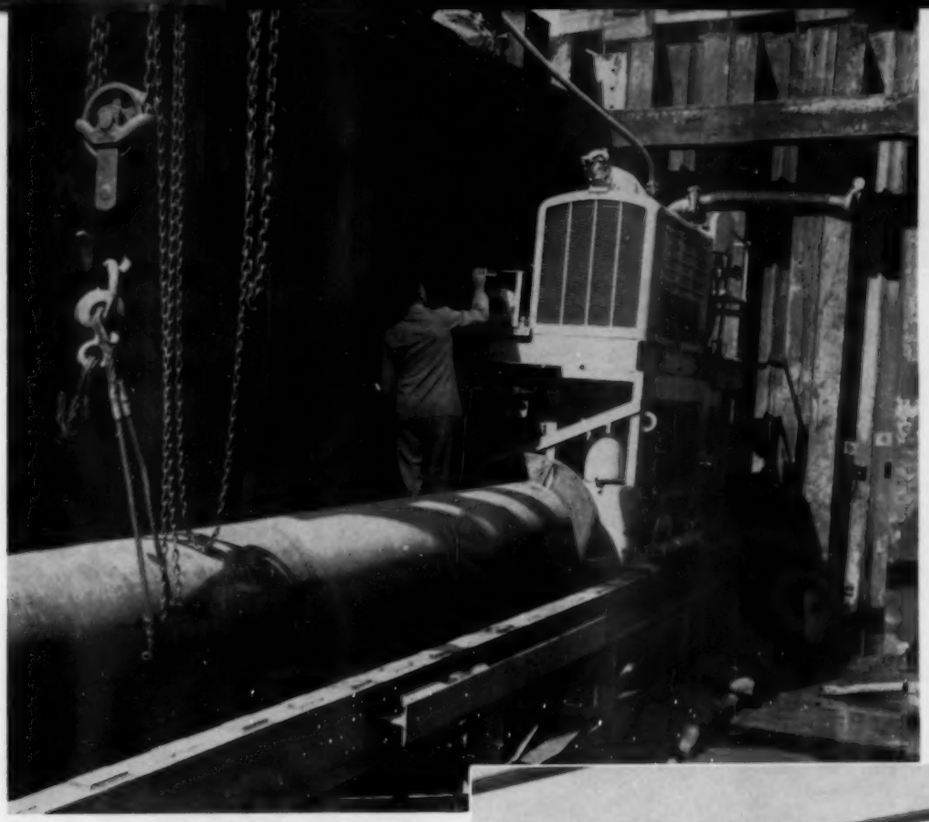
Tunneling requires removal of two or three times as much earth as the boring operation and the installation of steel supporting rings grouted in place. Such tunneling under railroad tracks may result in train slow-down in the work area and consequent passenger inconvenience. It may be restricted to off-schedule periods. In many instances the railroad will not permit penetration under the tracks by any method except boring. Thus we find a machine driven by a 200 hp General Motors model 6-71 diesel saving vast sums of money and preserving good public relations simultaneously for the Con Edison and railroad as well. While the machine has been chiefly confined to work for its owners, its design and operation is being studied by other utilities companies and by city water departments as a money saving means of installing mains in difficult places. Facts regarding it are given out freely by the Consolidated Edison Company. Design and construction of the big borer was preceded by construction and operation of smaller units. Con Edison boring experience dates back sixteen years. One predecessor is a 2 inch portable machine mounted on a trailer for mid-block and intersection boring. It is driven by a 25 hp gasoline engine with forward propulsion of the drill obtained manually through roller-chain and ratchet come-along assembly. Pipe bores from 30 to 90 ft long are made in a few hours with this machine.

The second machine in the series is mounted on what was an Army searchlight trailer. It bores from 2 to 6 in. diameters for a distance of 150 ft and employs hydraulic power to advance the pipe into the bored hole. Pipe bores from 30 to 90 ft long are made in a few hours. Some of its operational features are applied to the big diesel driven unit which we now present in more detail. This machine has a box frame made of welded steel components with a General Motors 6-71 diesel, rated 200 hp at 1800 rpm, mounted on top of it. The engine is connected to an Allison torque converter model TG-602-RM located under the engine in the frame and driven by silent chain and counter shafting, arranged to minimize the overall length of the assembly and thereby shorten the length of excavation in which it works. The Allison is connected to a specially designed and built 30:1 speed reduction gear box, made by the Silent Hoist Company. The final gear in this set is connected to a splined shaft for pipe boring drive. The Allison has three forward speeds and one reverse. Final output speed of the torque converter can range from 410 to 310 with the engine at a top speed of 1800 rpm. In this way the cutter speed can be varied from 13 to 10 rpm during top engine speed and full horsepower. For slower cutter speed the engine is throttled.

The machine is placed on tracks made of steel I-beams in two 18 ft sections, with total length slightly exceeding the combined length of the machine and a 24 ft section of pipe. Two sections are used in order to make short or long penetrations. The machine is shored in place at location on timber and wedged up for correct alignment. It is advanced bodily along the track in steps of 20 inches by hydraulic jacks receiving their oil pressure from a pump driven by a power take-off attached to the end of the engine camshaft from which 5 to 6 hp can be taken with safety. The pump is V-belt driven and delivers 2 gpm at 7500 to 9600 psi to the jacks of 100-ton combined pushing capacity. There is a front drive plate 38 inches in diameter on the final output shaft of the gear box. It resembles a face plate on an engine lather, and has three drive bars on its face that can be varied radially to fit any pipe of 16-36 in. diameter. The drive bars engage steel blocks welded to the inside of the boring pipe. A tri-cone cutter of the kind used in oil well drilling is welded to the end of the boring pipe and cuts to a diameter two inches larger than the pipe. When using pipe of more than 24 in. diameter supplementary cutters are installed around the outer periphery of the 26 in. tri-cone head which is the largest standard unit of its type commercially available.

There is a tube inside the boring pipe to carry slurry to the drill head. This slurry is a commercially available product known as "Aquajel". It is mixed with water and pumped to the drill head and through the bit which it cools and lubricates. It mixes with the soil and rock chips and acts as a vehicle to carry the spoil to a sump from which it is pumped to a vibrating shaker screen where the heavy aggregates are separated from the "Aquajel" which is then recirculated. A trailer carrying the "Aquajel" tanks, slurry processing pumps and shakers is a separate adjunct to the machine. When the borer has been set up, alignment made and the initial boring has been started, penetration will continue in a straight line to the point of exit regardless of strata formation, including rock. As the pipe progresses into the bore additional surface friction is built-up but this is less than may be expected because the slurry escaping at the cutter penetrates between pipe and earth and acts as a lubricant. Notches in the tracks at 20 inch spacing are engaged by pawls on the hydraulic jacks attached to the sides of machine. These notches are picked up progressively as the machine advances. When the pipe has penetrated its full length the machine is backed away for a fresh start and another length of pipe is welded to the one already interred. Then the operation is repeated. An example of long penetration is three runs of 180 ft each and three of 90 ft each under the Bronx River Parkway, an access road and under the New York Central Railroad's tracks for a total of 810 ft. Between 30 and 40 percent of this was through rock at a boring speed of 14 inches to 4 ft per hour, varying with differences in rock composition.

After using the machine for a time boring was done without trouble, but experience was gained the hard way. On one of the early 24 inch borings the cutter pipe encountered an angular rock formation and the hole followed the rock, thus bending the pipe. The tremendous torque of the machine kept the cutter pipe rotating, until it twisted, then broke the pipe walls of ½ in. section. Extraction



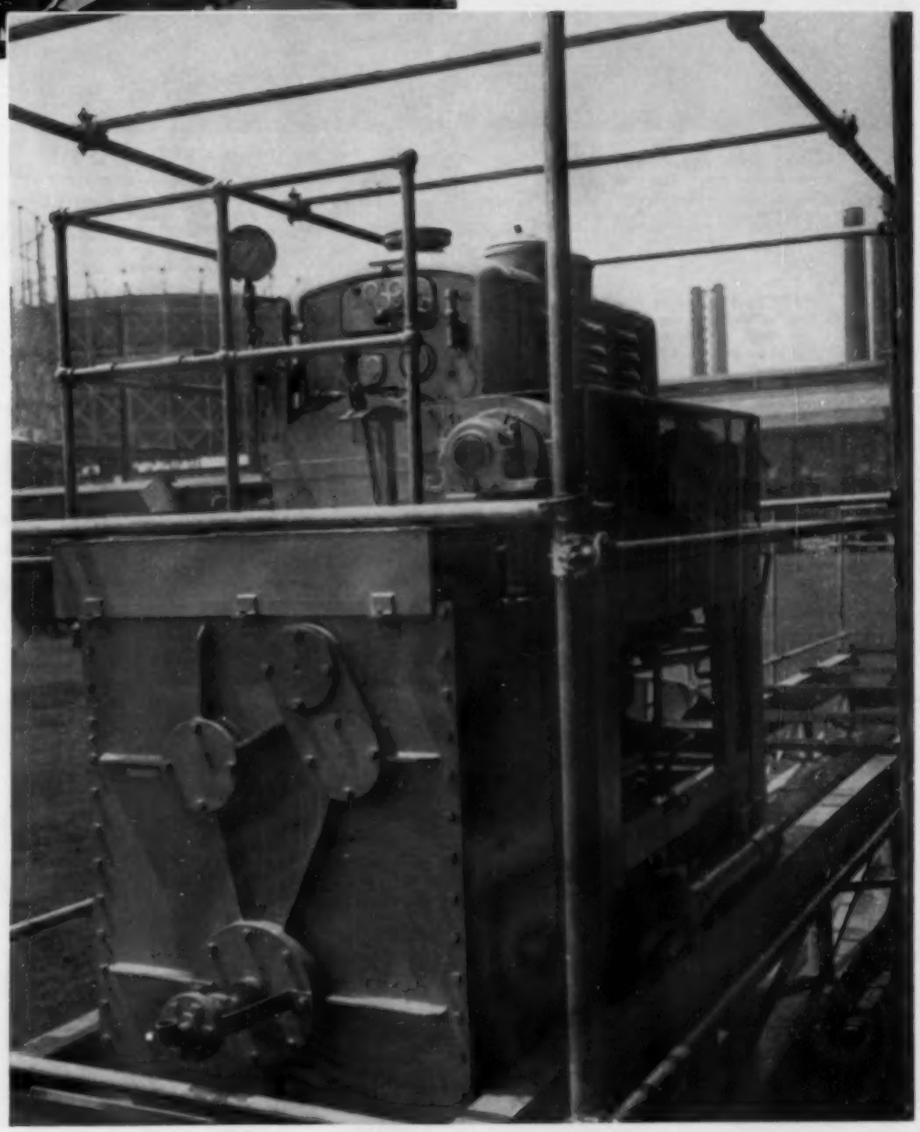
On the east shore of the Harlem River, opposite the Sherman Creek generating station, the machine is set up in a cofferdam ready to bore one of four twenty-four inch sleeves under thru railroad tracks of the New York Central between the river and the Major Deegan Expressway. Each sleeve is 110 ft long and will encase two pipe type high tension feeder.

of the broken parts was a long hard job. Now the operator riding the top platform on the machine instantly detects boring trouble, backs out and then resumes feeding at a very slow rate. At times when the cutter starts sticking the machine gives warning by rocking or tipping on its tracks. Operators have become so expert at boring that the pipe borer will cut through the side of a boulder without dislodging it. On a 10-hour operating cycle about eigth hours is actual boring time and two hours is spent re-setting and welding on more pipe. Generally speaking the Jimmy Diesel runs at full rpm for the 8-hour period. Overtime is sometimes worked to meet the time limitation set for job completion. When the cutter emerges at the end of the bore it is removed from the pipe with a cutting torch and if in good condition it is welded to another cutter pipe for use on the next job. In a 24 to 36 in. diameter penetration, the aggregates removed equal ⅓ to ½ the volume of a tunneling.

The 6-71 G-M diesel has performed with entire satisfaction requiring only minor, routine adjustments. It has been in service a year and a half and has not required overhauling. Mounted in a high frame, its excellent balance and freedom from vibration make the machine comfortable to live aboard. The exhaust is carried to the surface when the machine works in a deep excavation or it is directed to one side during operation on the surface. The diesel is a complete power package with radiator, starting equipment, and fuel tank integral with the assembly. A major factor influencing its selection as the prime mover for this specially designed and built boring machine was its compactness which enables it to be carried within the available overall length of mounting. Its torque characteristics and its fuel economy were contributing reasons for its selection. Another matter of importance was adaptability of the engine to use of an Allison torque converter matching the engine.

The diesel was sold by the Griffin Equipment Corporation of New York City who are distributors for the Detroit Diesel Engine Division of General Motors Corp. Their knowledge of the operational qualities of the engine as given to the Consolidated Edison Company was helpful in matching power to the requirements of the boring machine. Another factor of importance has been the prompt availability of service. It has been decided to use two more General Motors model 71 diesels, one a six and the other a four-cylinder engine, in two new boring machines of improved design.

Standing on the reaction rails the complete machine is shown at the Consolidated Edison plant in Long Island City, New York.



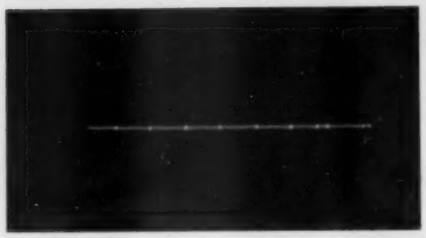
SPERRY ENGINE ANALYZER

AT the recent Oil and Gas Power Division of the A.S.M.E. Convention in Louisville, an excellent paper was read by Mr. H. E. Fisher, Research Engineer, Tennessee Gas Transmission Company and Mr. V. H. Miles, Field Engineer for the Sperry Gyroscope Company, on the general subject of "A Study of Industrial Engine Operation". This article will discuss this paper and at times quote from it, but the illustrations, in the main, will tell you the story.

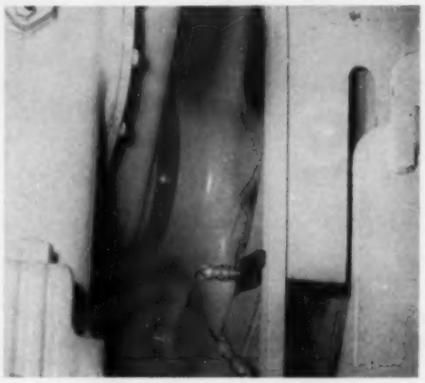
Recently a study was made of the gas transmission companies, petro-chemical industries, refineries, aluminum, and other power generating industries to determine their requirements for an engine analyzer. As a result of this study and of past experience, a completely new Industrial Engine Analyzer was designed and built to fit their particular needs. Sperry is now producing the Analyzer shown below. This Analyzer provides complete ignition, vibration, and pressure analysis. The instrument provides a great deal of information to the operator. Simplicity of operation and ruggedness of construction are fundamental in its design. No special electronics skill is required to operate the instrument, and anyone with a knowledge of engines can utilize the equipment with only a few hours of instruction. As a matter of fact, operators often understand their engines much better after using the Analyzer.

Vibration signals are generated by a vibration pickup which can be conveniently installed on a power cylinder or on any other part of the engine, such as the compressor cylinder valves. The pickup operates on the magnetostriction principle; that is, magnetic stress changes caused by mechanical vibrations cause the pickup to generate a voltage signal. The vibration signal is routed to the analyzer and selected by the signal selector switch. We might mention at this time that other observations can be made on the power cylinders to indicate (1) piston slap; (2) valve timing; (3) installation of incorrect valve cams (two-cycle engine); (4) mistiming of cam shaft (four-cycle engine); (5) worn ring grooves.

All of the troubles listed under ignition analysis have actually been found on operating engines. Most of the troubles are routine, and the beginner quickly becomes familiar with the pattern and associated trouble. This familiarity comes easily, since common troubles are repeated often with steady use of the analyzer. Such troubles as open primary or secondary coils, bouncing and arcing points, and open or shorted secondary circuits are common. Mistiming of the ignition system to an engine is a very prevalent, yet serious trouble. Unusual troubles warrant discussion at this time. For example, a magneto was found with a bent shaft which was causing ignition patterns to oscillate horizontally across the face of the screen. The trouble was analyzed as a bent shaft because of the regularity of the oscillations. Operation-wise, the ignition system caused plugs to fire alternately too-late and too-early. Other cases have been found

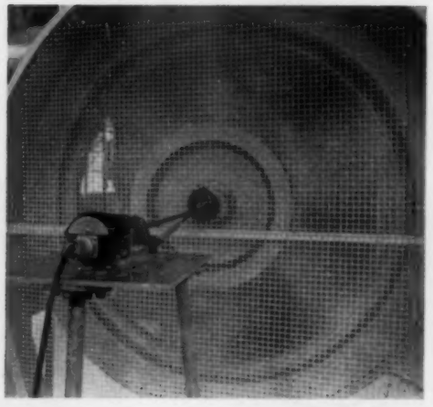


Timing marks may be placed at ten degrees before top center of all eight cylinders on an engine and at top center on reference cylinders. Although only one timing mark is necessary for most work, the operator sometimes finds it convenient to provide several. He has the choice of imposing dots or vertical spikes on the trace line for timing marks. By a simple screwdriver adjustment the operator can initiate the trace line at piston top center when the dial on the crankangle selector switch is set with the zero degree mark at that cylinder. No further timing adjustment is necessary. When timed, the operator can start the sweep from any point in the cycle on any cylinder. For instance, on a two-cycle engine a crankangle selector switch setting of 180 degrees indicates that the sweep is initiated at piston bottom dead center position.

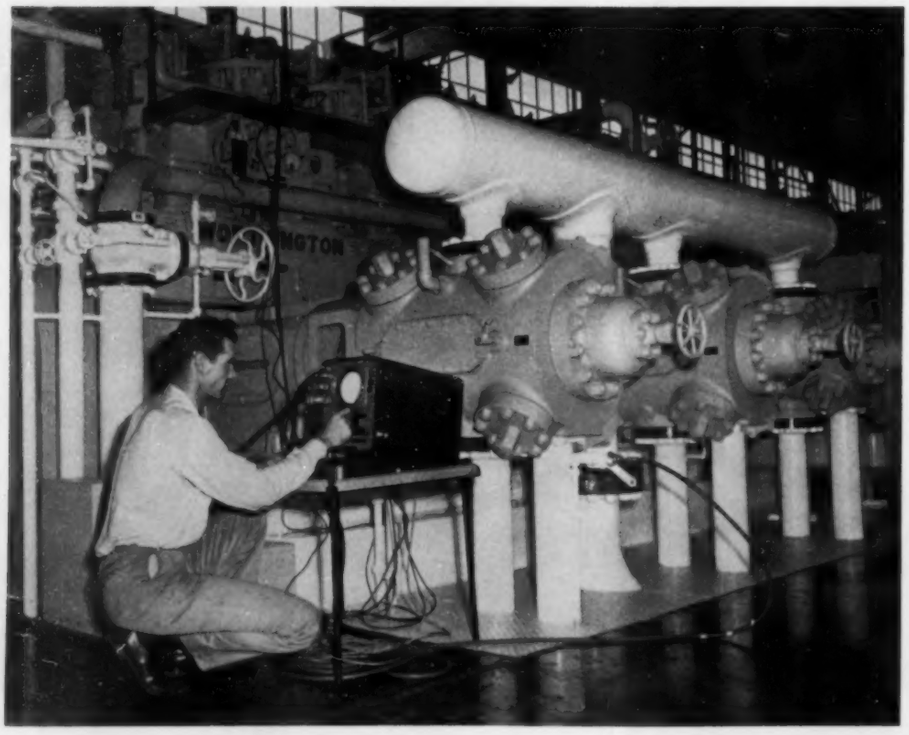


The timing pulse pickup provides information necessary to time the Analyzer to the engine. From marks accurately placed on the flywheel, the pickup "senses" the crankshaft position and sends the information to the Analyzer.

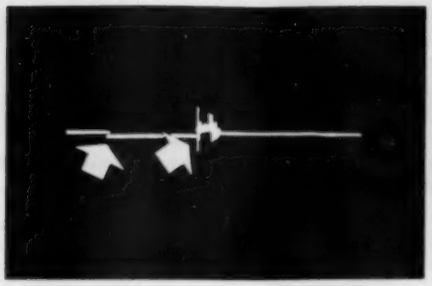
The synchronizing generator is driven at crankshaft speed on two-stroke cycle engines and half crankshaft speed on four-stroke cycle engines. It can be driven by a spring-loaded friction drive. This generator provides the signal necessary to initiate a sweep across the tube in step with the engine rotation. That is, the sweep traverses the screen once each time the engine completes one cycle.



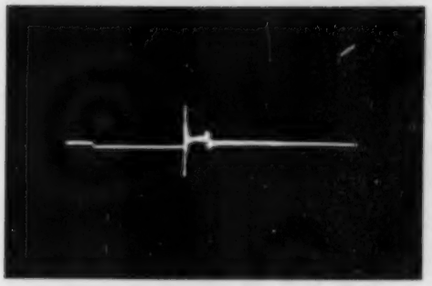
The Sperry Engine Analyzer is a dynamic electronic maintenance tool which will prove its worth by saving time and money for the users of either two or four-cycle spark-ignited engines. The Analyzer is a specialized type of oscilloscope; that is, engine information is presented on a screen similar to that of a television set. The system can be rapidly installed while the engine is running.



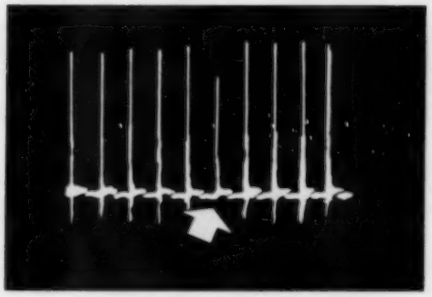
Ignition voltages are obtained from a convenient place in the primary circuit of the ignition system. The ignition voltages are connected to the analyzer in such a fashion that they cause a vertical deflection of the trace line. In effect, the screen shows a picture of ignition voltages with respect to engine crankshaft position.



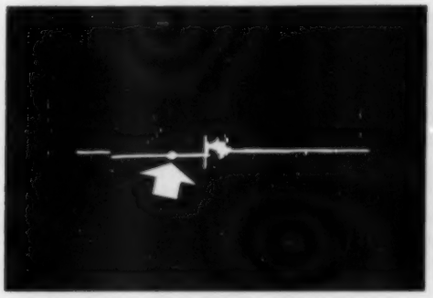
This ignition pattern shows points make (first arrow), coil saturation, points break (second arrow), plug firing over a five-degree period, and the return of the trace line to the zero voltage position. This is a typical normal pattern from a Rectox or a dc energy source ignition system.



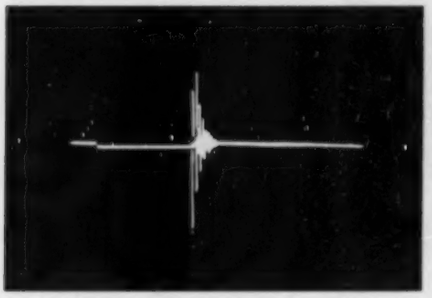
The shorted secondary circuit pattern shows a lower than normal amplitude with less high frequency oscillation, and the energy is dissipated over a longer period of time.



A typical ignition pattern from a common ten-cylinder, two-cycle engine equipped with magneto ignition is shown. It should be noted that the ignition voltage to one of the cylinders is low. This was caused by a shorted secondary circuit on one of the two plugs serving the cylinder. The sweep can be expanded horizontally for a detailed study of engine events for any cylinder.



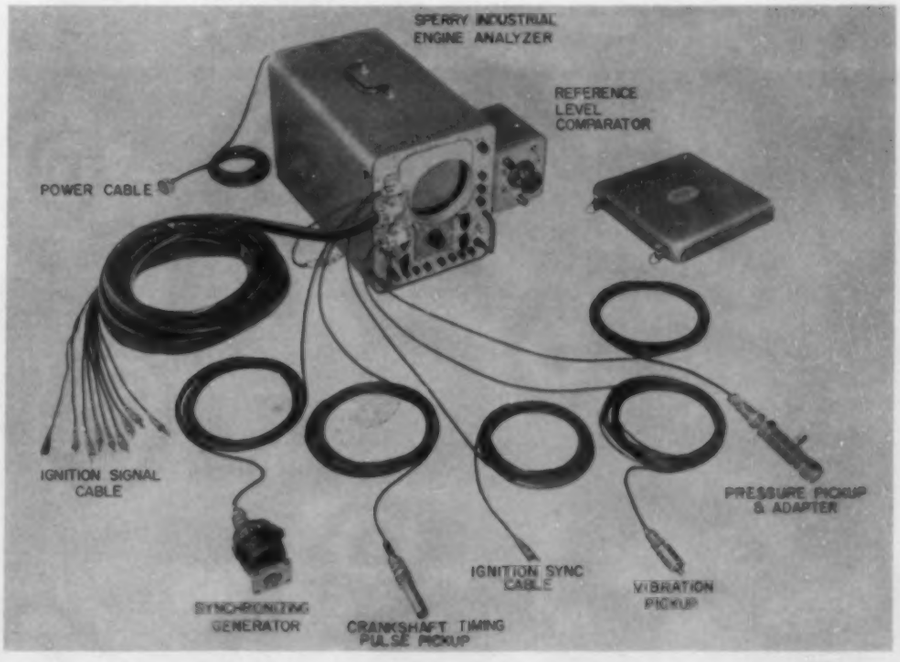
A timing dot (at the arrow) and an ignition pattern are shown simultaneously. The timing reference dot is at ten degrees before top center, and the ignition is set at four degrees, instead of the recommended six degrees, before top center. The timing reference dot is obtained from a mark on the flywheel. Ignition timing is conveniently read from the crankangle selector switch dial.

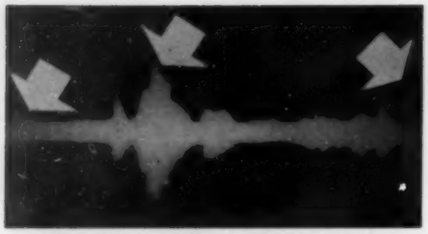


The open secondary circuit pattern has a higher than normal amplitude, but the available energy is dissipated over a shorter period of time.

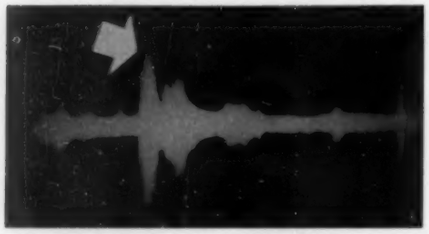
The Sperry Industrial Engine Analyzer sets out to provide complete ignition, vibration and pressure analysis.

The crank angle selector switch on the Analyzer allows the operator to initiate the sweep at any point of the engine cycle, for any cylinder. The trace line length represents 360 degrees on a two-cycle engine and 720 degrees on a four-cycle engine. Expanded sweep is provided to permit detailed analyses of engine events.

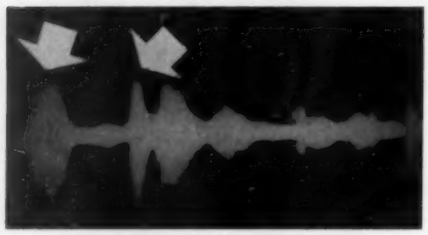




Patterns for two-cycle ported, spark-ignited gas engine, with the crank-angle set at zero degrees or top center for the cylinder under observation, the normal vibration pattern shows combustion activity (first arrow), exhaust blowdown (second arrow), scavenging, and the fuel-injection valve-closing event (third arrow).



Abnormal vibrations, such as those caused by scored ports (at arrow) are easily detected by their amplitude and location in the cycle. Abnormal vibrations are caused when rings cross over scored port areas during the range of 85 degrees to 110 degrees after top center.

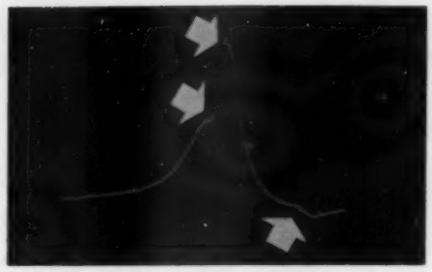


An attempt to load a cylinder, such as the one in this condition, will generally result in detonation. The first arrow indicates detonation; the second indicates excessive vibrations caused by rings passing over port areas.

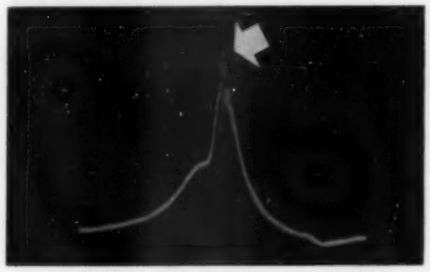
in which the ignition system driving mechanism was worn, causing excessive variations in timing. Ideally, the ignition system should be timed so that the peak firing pressure rise will begin at top center of the compression stroke. In practice, the ignition system is set so that the peak pressure rise will begin four or five degrees after top center, thus making the peak pressure about fifteen degrees after top center. On one high-compression engine it was noted that an ignition system timed late only two degrees caused the peak pressure rise to start at 25 degrees after top center and reach its peak at 35 degrees after top center. In this case, the advantage of the high compression was nullified by late ignition timing, and this caused increased fuel consumption.

With an instrument such as the Sperry Industrial Engine Analyzer, the engine operator or mechanic has a tool which he can depend upon to pinpoint troubles and to help him in tuning his engine to peak operating efficiency. Costly trial and error methods of trouble shooting are eliminated. Many expensive engine shutdowns can be avoided. Although this equipment is relatively new to industrial engine operators, its basic idea of operation has been soundly and unquestionably proven in the aircraft industry. The acceptance of the Industrial Engine Analyzer to date by operators of spark-ignited gas engines has been very encouraging. Should you be interested in more information on this Engine Analyzer just write to the Sperry Gyroscope Company, Great Neck, N.Y.

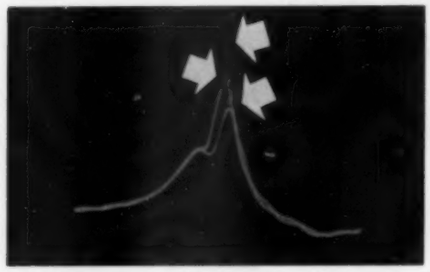
Pressure analysis is very important for balancing two-stroke cycle engines. It is no secret, however, that an engine must have a good ignition system and be in good mechanical condition before it can be balanced by adjustment of the gas valves. Pressure analysis can also be of use on four-cycle engines and on gas-compressor cylinders. The pressure pickup is connected to the cylinder pressure cock. Air cooling through an adapter is provided for two purposes: (1) to make handling more comfortable and (2) to avoid the possibility of damaging the pickup. The pickup is very rugged and can withstand temperatures of 350 degrees F without cooling; however, most operators prefer to use air cooling. The pickup operates on the variable reluctance principle.



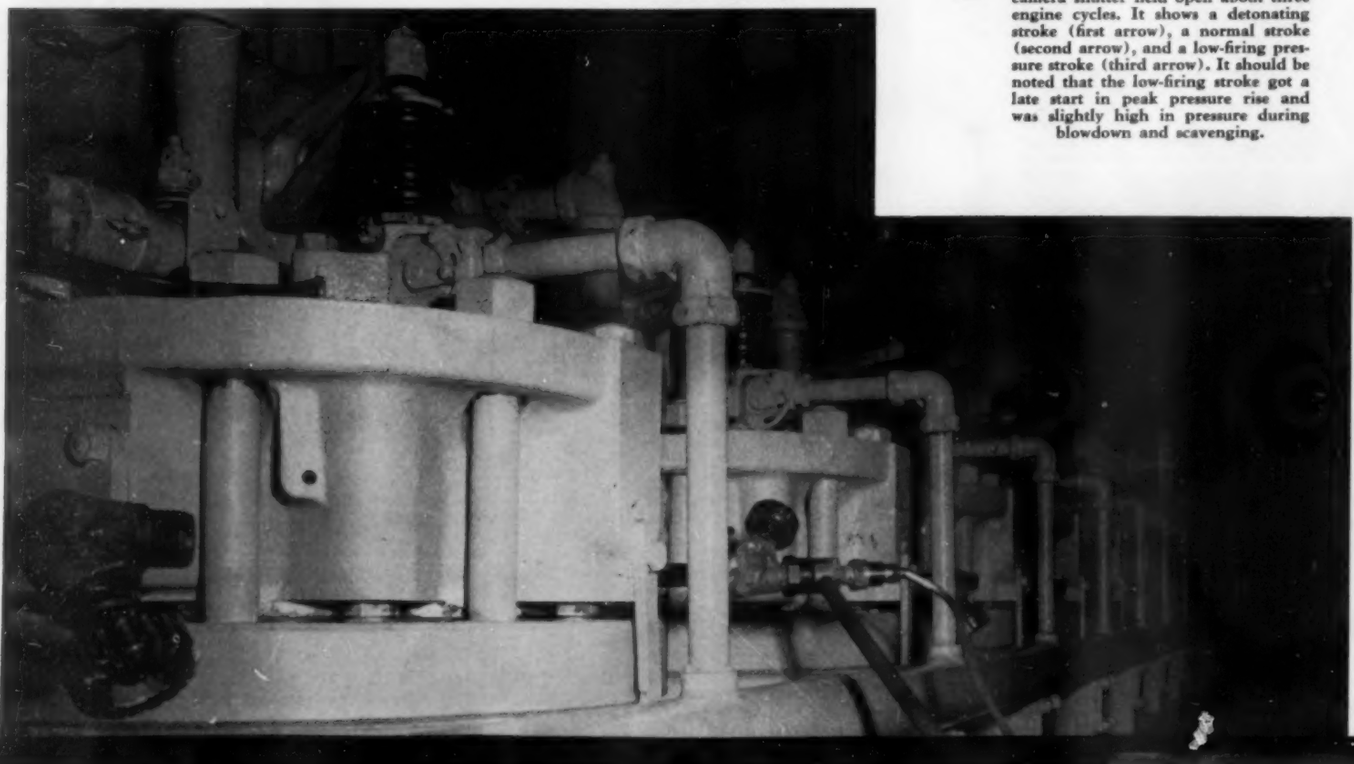
A typical, normal pressure pattern from a two-cycle engine is shown in the adjacent photograph. The trace line was initiated at piston bottom center, and the pattern, reading from left to right, shows part of the scavenging, the compression build-up, peak compression pressure (first arrow), firing pressure rise, peak firing pressure (second arrow), expansion of the gases, and exhaust blowdown (third arrow), followed by the beginning of scavening.



This photograph shows light detonation at the arrow.



This photograph was made with the camera shutter held open about three engine cycles. It shows a detonating stroke (first arrow), a normal stroke (second arrow), and a low-firing pressure stroke (third arrow). It should be noted that the low-firing stroke got a late start in peak pressure rise and was slightly high in pressure during blowdown and scavenging.



M/V *ELEANOR GORDON*

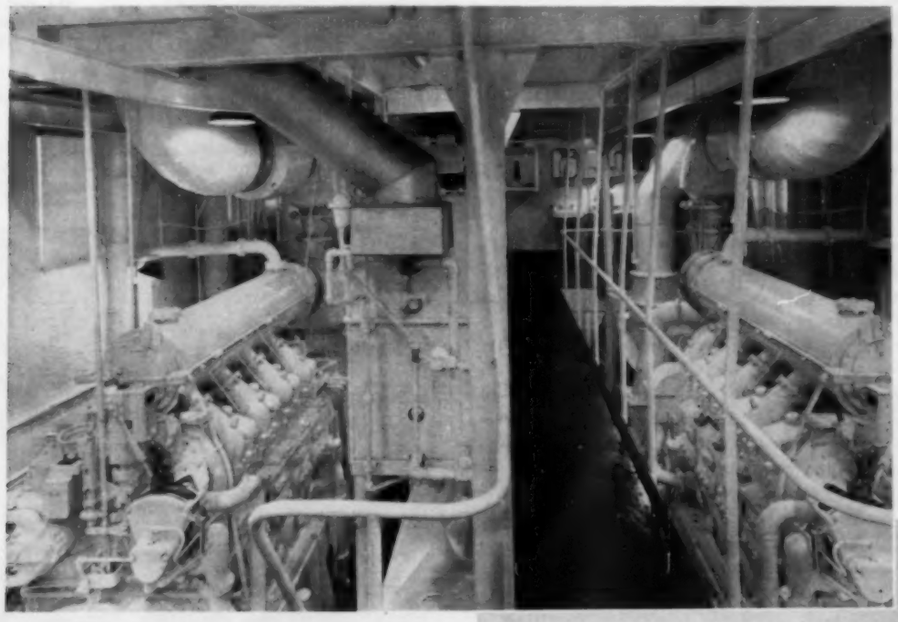
THE new towboat built by the Nashville Bridge Company, Nashville, Tenn. for the Mid-America Transportation Company, Nashville, was christened the *Eleanor Gordon* at Nashville on Saturday, September 21, 1957. The new towboat was christened by Mrs. Gordon for whom the boat is named. Mrs. Gordon is the wife of Capt. Noble L. Gordon, President, Mid-America Transportation Company. The M/V *Eleanor Gordon* is the first towboat to be put in service by Mid-America. Mid-America Transportation Company was organized in May 1956. The M/V *Eleanor Gordon* will immediately go in service hauling coal and general dry cargo on the Ohio and Mississippi Rivers. The fifteen barges, now being completed, are the "jumbo" type, each capable of carrying 1440 tons of coal. She is the most modern design towboat. The specifications are as follows: Length, molded—149'0"; breadth, molded—35'0"; depth, molded—10'4½"; draft, normal operating—8'0"; displacement, normal—840 tons.

Fuel Oil—71,500 gals.; potable Water—3,500 gals.; wash Water—4,000 gals.; lube Oil—3,500 gals. Propulsion: main engines—Two Cleveland Diesel, 8-cylinder, model 498 turbocharged, 2-cycle diesel engines, rated 1350 shp at 850 rpm; reverse reduction gears—3.954:1 Ratio. Auxiliary machinery: main generators—Two 60 kw, 230 volt, 3 phase, 60 cycle generators each driven by a General Motors model 6-71 engine.

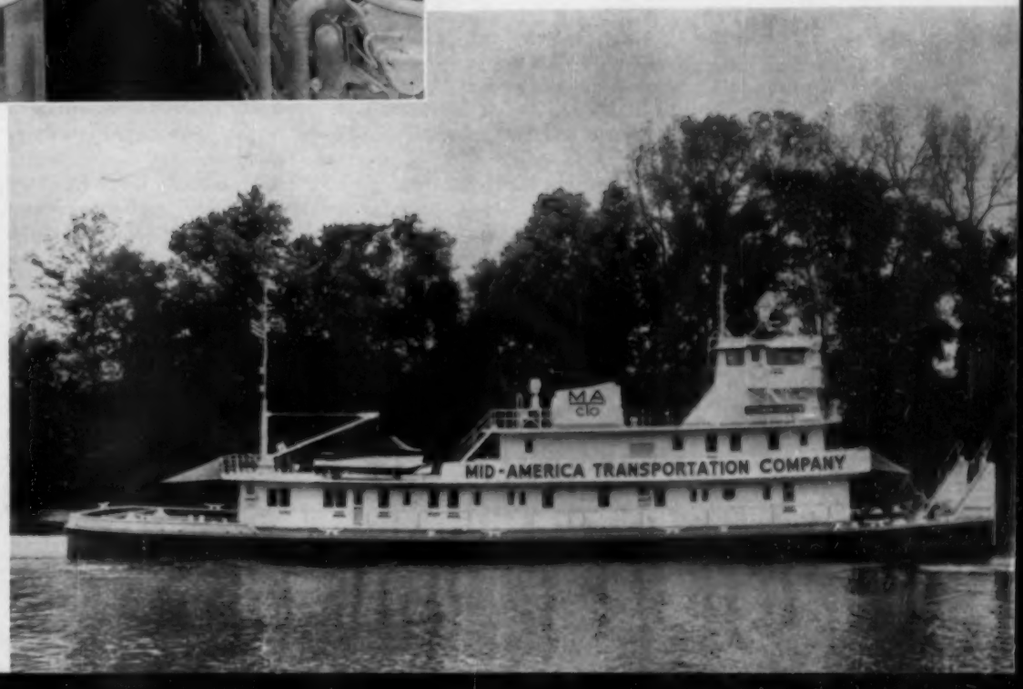
After the christening ceremonies a reception and dinner was held at the Noel Hotel, Nashville, Tenn. One hundred fifty guests attended. At the reception, Harry Dyer, President of Nashville Bridge Company said, "We are proud to be the builders of the *Eleanor Gordon* for the new and progressive Mid-America Transportation Company." He also paid tribute to the ability of Capt. Noble L. Gordon.

Thomas E. Hughes, General Manager of the Cleveland Diesel Engine Division of General Motors pointed out that the long association with Harry Dyer and Capt. Gordon was a most pleasant one. Others who attended the christening ceremonies, reception and dinner were: John Hawkinson, Des Moines, Ia., a director of Mid-America Transportation Company; Harry Mack, President, Neare-Gibbs Company; Alex S. Chamberlain, Vice President, Ashland Oil & Refining Company; K. O. Keel, General Sales Manager, Cleveland Diesel; Charles Bogman, Manager, Marine Department, American Bridge Company; Robert L. Gray, Marine Superintendent, Ashland Oil & Refining Company; R. A. Henshaw, Manager, Marine Department, Nashville Bridge Company; and R. S. Ramsay, Manager, Marine Sales, Cleveland Diesel.

Left to right: Mrs. Eleanor Gordon, Captain Noble Gordon. Mrs. Eleanor Gordon christened the first towboat owned and operated by the Mid-America Transportation Company, the *Eleanor Gordon*.



Engine room of the M/V *Eleanor Gordon*, owned and operated by the Mid-America Transportation Company and built by the Nashville Bridge Company. The M/V *Eleanor Gordon* is powered by two 8-cylinder Model 498 turbocharged 2-cycle Cleveland Diesel marine engines. Marquette governors and Briggs lube filters are used.



The first towboat operated by the Mid-America Transportation Company is the M/V *Eleanor Gordon*. This towboat was built by the Nashville Bridge Company and is powered with two 8-cylinder model 498 turbocharged 2-cycle Cleveland Diesel marine engines.

UNATTENDED AUTOMATIC PUMP STATION

Topeka Station is One of the First Unattended Installations Handling Liquid Products Transmission; Complex Instrumentation Accurately Controls Operation of Diesel Engine, Pump and Other Equipment from More Than 100 Miles Away.

IN this era of automation, the pipeline industry has been active in seeking ways to reduce manual operation and maintenance of the hundreds of pumping stations scattered across the country. As early as 1937, automatic pump stations had been considered and, as the industry grew during and after World War II, some experimental work was undertaken. However, the actual development and construction of fully automatic, remote-controlled, electric-powered pump stations did not come about until the last few years, and diesel stations were tried only recently. There are several reasons for the development of automatic diesel stations. Foremost, of course, is the diesel's advantage where large blocks of electric power are not available, and its flexibility everywhere. The main drawback was the complex instrumentation necessary to control diesel stations. In addition, control equipment of the type necessary for pipeline stations was not available in any quantity until recently. This forced the pipeline engineers to adapt controls originally developed for other processes to meet the needs of pump station instrumentation. Despite these problems, one pipeline company went ahead with a plan to construct and operate an unattended diesel station.

In early 1956, the Great Lakes Pipe Line Company successfully operated an unattended pump station powered by a diesel engine. The company has pioneered products pipeline transportation since 1930, and has grown into one of the country's largest transporters of refined products. The station, located near Topeka, Kan., is on a 10-in. line through which petroleum products flow from Eldorado, Kan., into the company's main-line station at Kansas City, Mo. The station is controlled from Eldorado, which is more than 100 miles away, and is the first diesel remote-controlled, unattended, automatic station to handle the flow of liquid petroleum products. A small brick building, adjacent to a fuel oil storage tank, filters and other equipment, houses the pumping unit and instruments. The pumping equipment includes a six-cylinder, four-cycle supercharged Alco diesel engine. It develops 800 hp at 925 rpm, and is the most thoroughly balanced unit on the market today. It is characterized by a minimum of internal moment because of complete static and dynamic balancing of the shaft system and rotating parts. A four-stage centrifugal pump, which is separated from the engine area by a fire wall, handles 1340 gpm against a head of 2180 ft. To further insure safety against fire, a special seal is fitted around the high-speed shaft between the gear on the engine side of the fire wall and the pump shaft on the pump side of the fire wall. Four rooms—the pump room, engine room, control room and storage room—comprise the station. A battery power supply operates all control circuits and electrical equipment in the station to assure continuous operation. In addition, a 48-v dc power supply is sent into the station. In case of power supply difficulties, air bottles containing sufficient compressed air to operate air controls for two hours are installed. This equipment is housed in the control room. Mounted on the station roof is an air-cooled radiator for cooling the engine-jacket water. A fan is driven at variable speeds by a hydraulic motor and a hydraulic pump. It is connected to the front end of the engine crankshaft. In cold weather, the engine-jacket water is warmed by an auxiliary water-circulating pump and electric heater.

Operation of the instruments which control the engine is accomplished by three methods: pneumatic, electric and electromechanical. They fall into three categories—devices to start, stop and control engine speed; mechanisms to control the engine operating temperature; and safety controls. Some of the more important instruments in the above categories are: pneumatic speed transmitter, tachometer, pneumatic pressure controller and pneumatic pressure transmitters. When the start signal is transmitted from Eldorado—more than 100 miles away—motor-operated incoming and outgoing gate valves are opened. Upper limit switches on these valves are then closed, thus actuating a solenoid-operated pilot valve which operates the main starting air valve to crank the diesel engine. Air pressure can be built up for five successive start attempts and then, if the engine fails to start, a counting switch opens to relay a signal to the Eldorado control station. The pneumatic speed transmitter produces air pressure which rapidly increases as the engine starts and builds up speed. As this air pressure reaches four psi, a pressure switch opens the starting circuit, cutting off air to the cranking motor. An idle-speed controller operates the engine on a fixed throttle during a warm-up period. This device functions on basically the same principle as a standard hydraulic governor.

As the engine-jacket water reaches a predetermined temperature, a temperature switch closes and starts the pneumatic pressure controller, which builds its output until it exceeds the idle-speed controller. The engine speed gradually increases to a normal operating level and drives the pump in the next room. Normal shutdown requires about 15 minutes. A signal is transmitted to

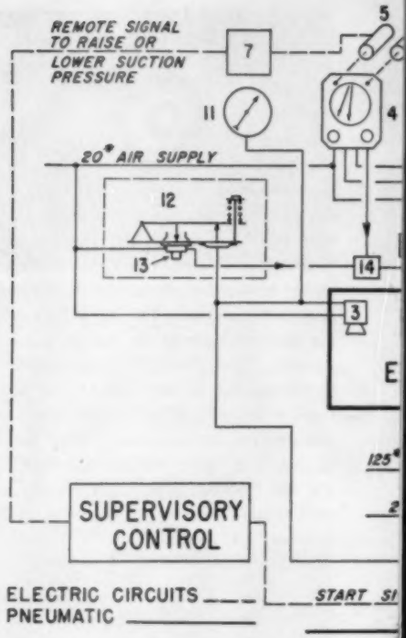


Figure 1. Schematic diagram of the station control system.

Complex instrumentation is required to c
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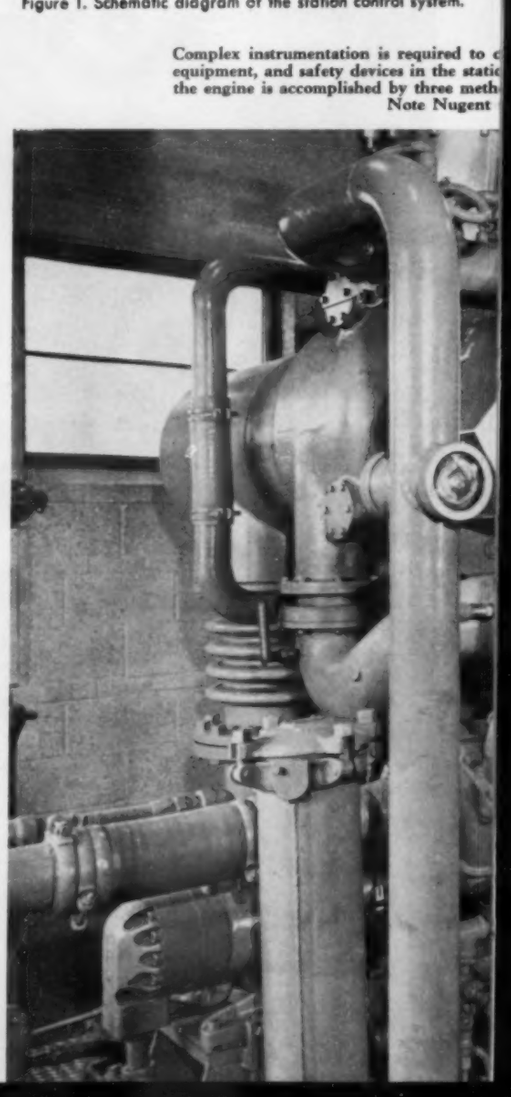
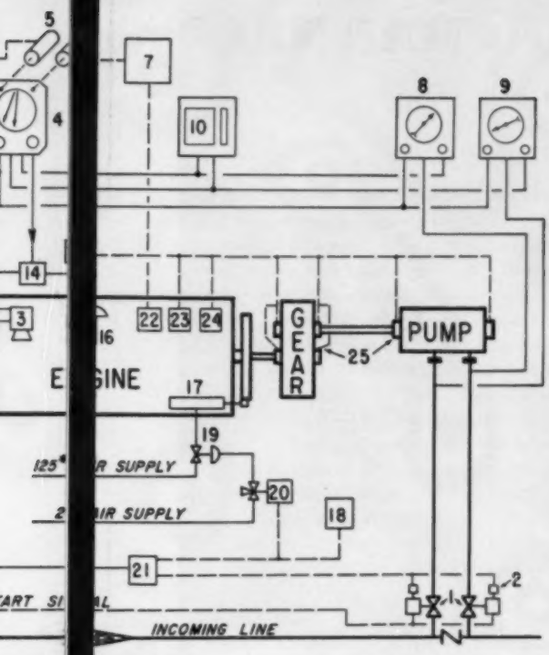




17. Air starting motor.
18. Counting switch.
19. Starting air valve.
20. Starting air pilot valve.
21. Pressure switch.
22. Water-temperature switch.
23. High-water-temperature switch.
24. Low-lube-oil-pressure switch.
25. High-bearing-temperature switches.

rol this Alco diesel engine, other pumping Operation of the instruments which control pneumatic, electric and electromechanical. rs fore and aft.

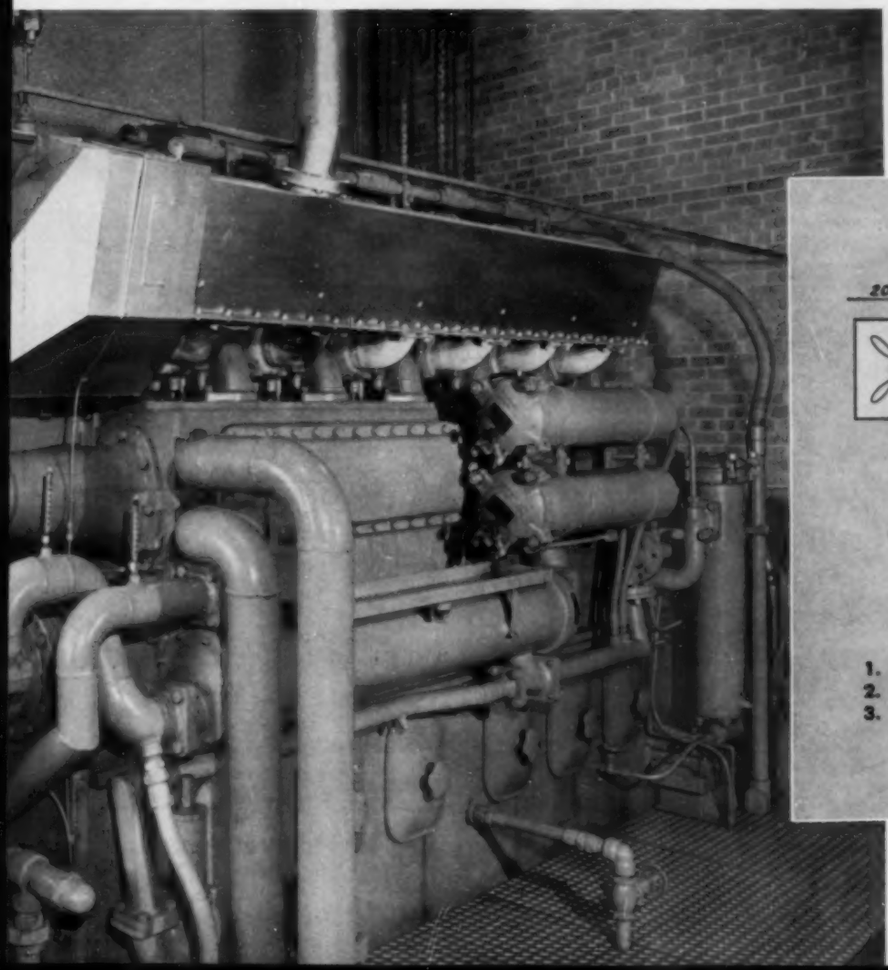
the gearhead motor in the pneumatic pressure control and slowly lowers the discharge-pressure control point. As this happens, the speed of the engine slowly decreases. At the same time, the temperature controller lowers the temperature and slowly cools the engine. As the engine speed drops to idle, a three-way valve is de-energized to shut the unit down. The controls are then automatically reset to the start-up position.

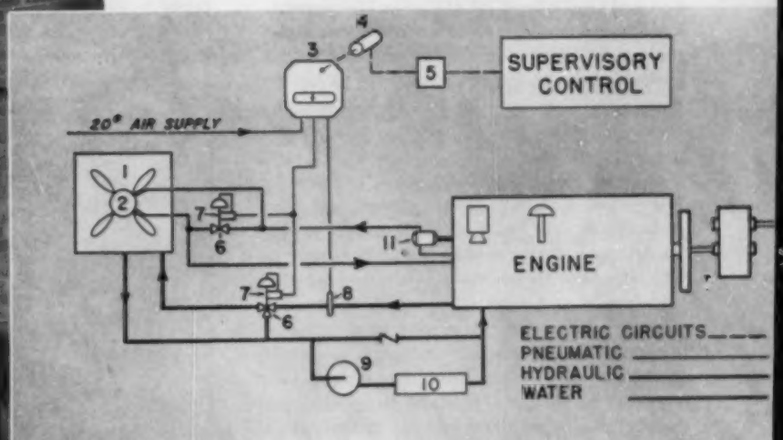
Several safety devices on the engine can be attached if an emergecy condition arises. Such conditions as high jacket-water temperature, low jacket-water level, low lube-oil pressure, high gear-bearing temperatures, high pump-bearing temperatures, low suction pressure, high discharge pressure, engine overspeed, low instrument air pressure, and pump seal leakage can be detected by safety devices which automatically stop the engine. A signal from the control station can also be utilized to actuate the three-way valve mentioned above. This dumps the air from the diaphragm operator, producing a condition which shuts the engine down instantly. A system was devised to monitor the load balance between cylinders, which is normally determined by comparing exhaust gas temperatures from each cylinder in the diesel engine. Six exhaust-gas thermocouples which were standard equipment on the Alco engine were used. Between each pair of thermocouples a meter-type relay was inserted in the circuit, thus connecting them in series. The thermocouples were connected alternately positive to positive and negative to negative. Consequently, as long as all thermocouples are subjected to equal temperature, their outputs oppose and there is no current flow. If there is an unbalance, a signal is sent to the control station, where adjustments are made. A multipoint selector switch can be manually thrown to connect the thermocouples to a conventional pyrometer for check purposes.

Great Lakes Pipe Line officials report that the station is operating completely unattended, and the only attention it receives is a semimonthly inspection. All engine controls and instruments are functioning satisfactorily. So sensitive are the supervisory controls that a faulty nozzle in the engine was detected by the operator in the control station in Eldorado, and he, in turn, informed the area mechanic, who promptly corrected the trouble.

This is the pipeline pumping station operated by Great Lakes Pipe Line Company near Topeka, Kansas. It is a completely remote-controlled unattended automatic station. Note American Cycoil filter.

Editor's Note: We are glad to give full credit to the "Alco Products Review", from which so much of this interesting data was obtained. Diagrams one and two were used through the courtesy of the "Oil and Gas Journal."





LEGEND

1. Radiator.
2. Hydraulic fan motor.
3. Temperature controller.
4. Gear-head motor.
5. Reversing switch.
6. Diaphragm-operated valves.
7. Valve positioners.
8. Temperature bulb.
9. Auxiliary water pump.
10. Water heater.
11. Hydraulic pump.

Figure 2. Schematic diagram of the engine cooling system.

DEEPENING THE AMHERSTBURG CHANNEL

By JIM BROWN

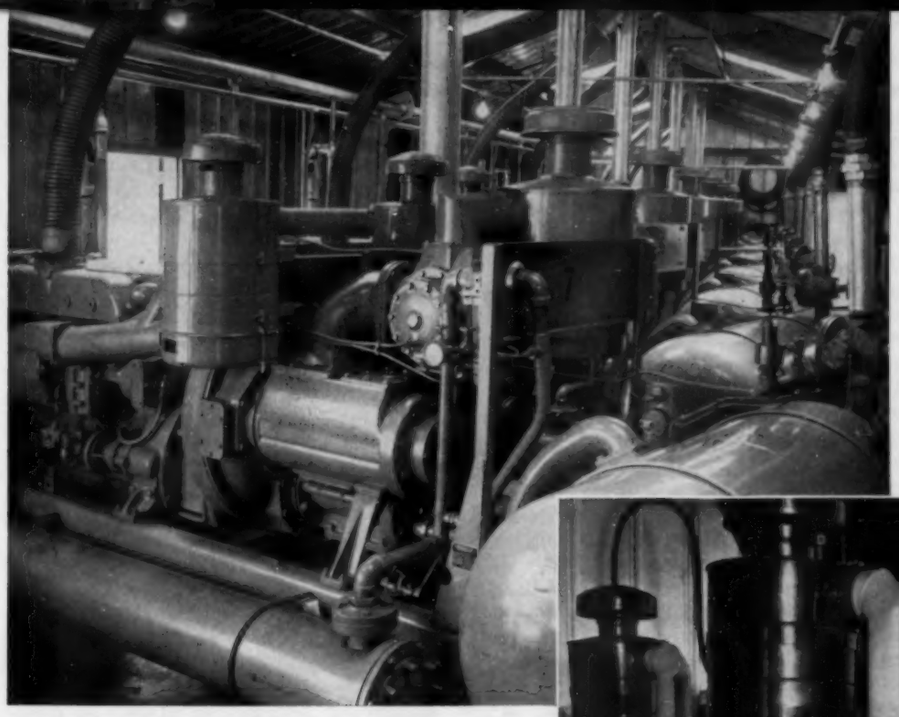
ON May 28, 1957 with a gigantic "Boom" and a wholly satisfactory geyser of water, a spectacular blast near Bob-Lo Island in the Detroit River opposite Amherstburg, Ontario signalled the start of a $136,000,000 excavation project. It was the official opening of the Great Lakes Connecting Channels Project which is under the direction of the U. S. Army Corps of Engineers. The ceremony indicated that the initial step, the deepening of the Amherstburg Channel in the Detroit River which connects Lake Erie with Lake St. Clair, Lake Huron, Lake Michigan and Lake Superior to the north was officially under way. This ceremonial blast was set off by The Honorable Paul J. J. Martin, Q. C., then Minister of National Health and Welfare of Canada; Walker L. Cisler, President of the Detroit Edison Company and The Hon. Wilber M. Brucker, Secretary of the Army. Subsequent "brass tacks" blasting of the river bottom, which has since continued almost hourly around the clock has been less spectacular. In sheer magnitude and predictable advantages to be gained for the very essential Great Lakes water transportation of iron ore, coal, oil, limestone and grain, the opening of this project deserved every bit of fanfare that a wide-awake Inauguration Committee could give it, however. Our Federal Government's interest in the improvement of navigation inland from the St. Lawrence River has been evidenced since 1824, when $20,000 was appropriated for a harbor improvement by the Corps of Engineers at Erie, Pennsylvania. Harbor improvements have been made consistently ever since and improvement of the Connecting Channels has been underway over 100 years. An act passed on July 8, 1856 made the Corps of Engineers responsible for providing a 14-foot deep channel through Lake George to the lower St. Marys River. What the Corps (with the cooperation and assistance of the Canadian Government) has accomplished since is evident in the fact that the present controlling depths between Lake Superior and the St. Lawrence River are 24 feet for downbound ships and 20 feet in the upbound channels.

The Connecting Channels Project will require the full output of 8 large dipper dredges, two large hydraulic dredges and a sea-going hopper dredge. Each dipper dredge will be attended by one or two large tugs, a derrickboat, one or two launches and from 2 to 4 large dump scows. In channels with rock bottoms, dredging must be preceded by submarine drilling and blasting operations involving the use of special drillboats. The working force necessary to man and supervise the dredge fleet will be from 800 to 1000 men. The majority of the equipment mentioned above — excavators, crew boats and tugboats are now diesel powered. In addition, a new type of diesel drilling barge (described below) shows great promise as a valuable addition to the diesel fleet which will help to bring this effort to a successful conclusion. Just as our roads and highways have had to be widened through the years from single-lane 10-foot strips to the point where 4-lane divided highways with 24 feet of pavement in each direction are common, the present 24-foot minimum downbound depths and 20-foot upbound depths have been ruled obsolete and inadequate for the lake cargo boats in service today and for the years to come. To enable the more efficient loading of 600-foot to 700-foot Great Lakes Carriers now in use (with many more predicted by 1985) the Connecting Channels must be deepened to a minimum of 27 feet. This is no small task as it involves the removal of from 3 to 7 feet of earth and rock from channels 300 to 1500 feet wide over a stretch of nearly 160 miles. Many people erroneously think of the Connecting Channels Project as part of the St. Lawrence Seaway but it is not. Both have an International aspect, so far as benefits are concerned, but the Connecting Channels Project is being financed completely by the United States and is completely under the jurisdiction of the U. S. Army Corps of Engineers. Originally designed as a means of giving relief and greater efficiency to Great Lakes shipping, the Connecting Channels Project will also provide timely access to the Great Lakes for St. Lawrence Seaway traffic. Tied in with State and Municipal harbor improvements it will be the key to greater utilization of the St. Lawrence Seaway.

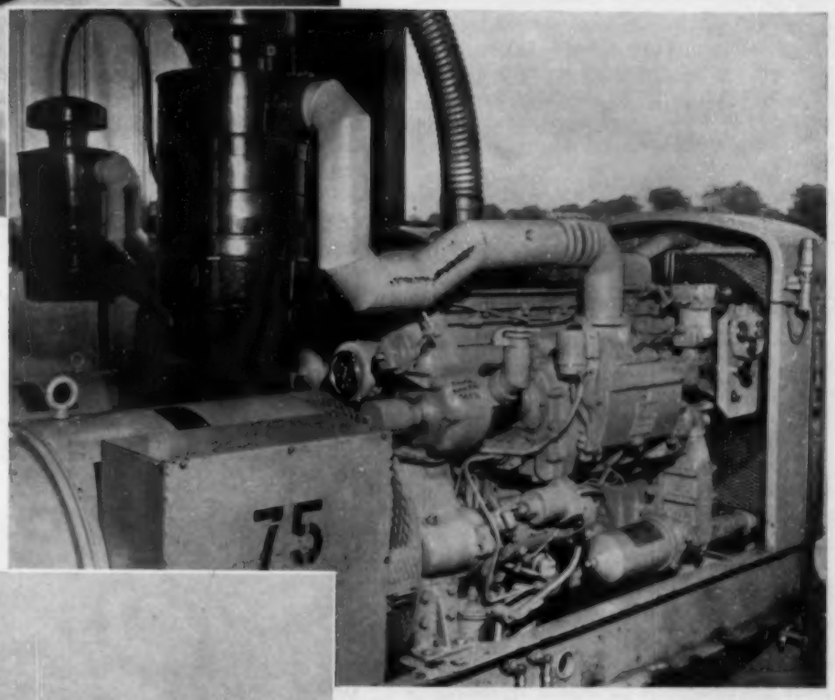
According to Colonel Peter C. Hyzer, District Engineer, Detroit District Corps of Engineers, the Connecting Channels Project has been scheduled to provide incremental or progressive benefits as the work progresses between the present and June, 1962, the target completion date. However, continuation of the project depends upon yearly appropriations allowed by Congress. Col. Hyzer also told us that the most critical areas, and the ones which are being tackled first, are the Middle Neebish Channel which leads in to Lake Huron from below the Sault Ste. Marie Locks and the Amherstburg Channel in the Detroit River from Amherstburg, Ontario to the river's outlet in Lake Erie near Toledo, Ohio. The Amherstburg Channel, a bow-shaped stretch running roughly North and South on the Canadian side of the Detroit River is approximately 8½ miles long and currently 21 feet deep. It is to be excavated over half of its 600 feet of width to a minimum swept depth of 27.5 feet with approximately 23,700 feet of its length going to a minimum swept depth of 28.5 feet. The project includes the removal of 800,000 cu yds of overburden and 1,373,000 cu yds of rock. Approximately ⅔ of the material to be removed is either solid ledge rock or highly compacted material requiring blasting ahead of the dredges. The job includes building about 15,000 linear feet of compensating dikes and removal of the balance of the rock and other excavated material to spoil areas. Maximum water haulage of the spoil will be about one mile.

Following their policy of utilizing the services of private construction firms when available in sufficient magnitude, the U. S. Army Corps of Engineers has let contracts for all the Amherstburg Channel excavation. A group of contractors banded together under the name of "Marine Operators" and consisting of the Al Johnson Construction Co. of Minneapolis, Minn., Peter Kiewit Sons Co. and Cunningham Kiewit Co. of Omaha, Neb., and Morrison-Knudsen Co. of Boise, Idaho made the successful bid on the upper 6 miles of the channel, at $16,322,000. The Great Lakes Dredge and Dock Company of Cleveland, Ohio will excavate the remaining 2½ miles on a $6,566,000 contract.

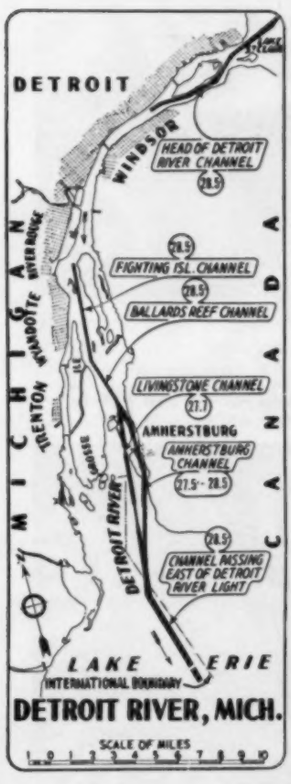
Since excavating the Amherstburg Channel to greater depth is primarily a "hard rock" job the key to speedy operation lies largely in drilling for blasting. Great Lakes Dredge and Dock Company is relying on the time-honored steam drill barge in their end of the channel but Marine Operators has devised and (so far) successfully initiated a unique type of diesel drilling barge. This sectional steel barge, built by Manitowoc Shipbuilding Company and called the *Hornet* was assembled and



Rear view of the *Hornet IV*, Marine Operators' drilling barge. Seen behind the towering drill masts are the explosives barge, an air-operated winch and 3 massive "spuds" which control position of the barge and the engine room which houses 9 GM Detroit Diesel engines, 7 Ingersoll-Rand 900 cfm compressors and 2 Kato generators.



The 7 GM Detroit Diesel 6-110 engines and Ingersoll-Rand 600 cfm Rotary air compressors on the *Hornet IV*



Kato light plants of 40 and 75 kw, powered by GM Detroit Diesel 4-71 and 6-71 engines provide current aboard the Marine Operator's drilling barge for round-the-clock operation.

fitted out by Marine Operators at the Ojibway Slip between Windsor, Ontario and Amherstburg. The *Hornet* drills twenty 4½-in. holes 8 ft apart to the required depth in the bottom of the channel, places the explosive charges, moves back to allow the charges to bet set off and resumes position for drilling at approximately one-hour intervals. Its position controlled by spuds and by air-operated winches and lines leading ashore, the *Hornet* enables the rock to be blasted loose for easier excavation without interruption of the heavy summer river traffic. It is manned by three alternating crews of 18 men, on three eight-hour shifts. The *Hornet's* sting is provided by 20 Joy rotary air drills projecting above and below the side of the barge. The drills in turn are actuated by seven 900-cfm Ingersoll-Rand air compressors, each powered by a Detroit Diesel 300-hp model 6-110 engine. Two other Detroit Diesel engines on board, a 4-71 and a 6-71, power 40 kw and 75 kw Katolight generators to furnish electric power for general services and for illumination at night. The *Hornet* is attended by a workboat, the *Steve W.*, which is powered by a 6-71 Detroit Diesel Marine engine and which also works "around the clock" carrying crews, explosives and other supplies out to the drilling activity.

Because of the built-up character of the area adjacent to the Amherstburg Channel, the Corps of Engineers has done considerable research on the effects of blasting the river bottom. Crews of seismographic observers are kept busy night and day recording the tremors which must be regulated for the safety of buildings and the comfort of residents. In the Marine Operators' present working area delayed-action caps are used to cause the 20 charges to fire in sequence, rather than simultaneously.

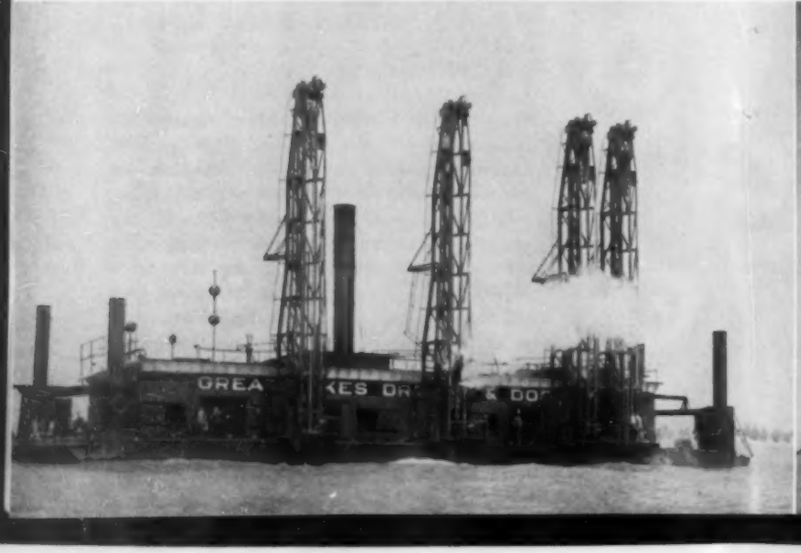
Marine Operators are using approximately 1½ lbs of 60% C.I.L. Gelatin per cu yd blasted, and the total charge per blast is about 460 lbs. Working farther down-river and farther from shore, Great Lakes Dredge and Dock is allowed to fire 24 holes at a time instantaneously and are using 75% DuPont Gelatin in their work. The U. S. Army Corps of Engineers and the contractors involved have striven for and have attained very good public relations in the area with the result that complaints with respect to the blasting operations have been minimal. Just arrived at the scene and engaged in its first excavating trial runs was the *Samson*, a barge-mounted Bucyrus-Monighan walking-type dragline of 12 cu yds capacity. This huge diesel-electric dragline had seen service on the St. Lawrence Seaway as a land-based excavator. It is powered by an 8-cylinder, naturally aspirated Cooper-Bessemer engine rated at 750 hp at the relatively low 400 rpm speed at which it is now being operated. In service now only three years, the engine is the pride and joy of Carter Crouch, the operator who has run this dragline since 1948.

On its tryout in the river, with a 12-yd bucket pulling up previously blasted material, the *Samson* seemed only to be loafing as Mr. Crouch put it through its paces by flicking six tiny control levers and nudging a throttle. The *Samson* has a 160-foot boom and is so mounted on a 175 ft x 65 ft steel barge that the entire upper works swings effortlessly from side to side as the bucket is hoisted and dumped. Abroad the *Samson* we noted also two 600 cfm Ingersoll-Rand portable air compressors, driven by 6-cylinder series 71 Detroit Diesel engines, used to furnish pneumatic power for the barge's positioning spuds, winches, etc. The *Samson* was towed to its first location by the 77 ft tug *John Roen* which has an 8-cylinder (640 hp at 320 rpm) Superior diesel engine. The *John Roen* will attend the *Samson* and will presumably be the craft that will tow the rock-laden barges to the compensation dikes and spoil area. The *John Roen* is fitted with towing knees and thus makes an unusual appearance in this area. The drilling barge *Hornet*, the Bucyrus-Monighan dragline *Samson*, the crew boat *Steve W.* and the tug *John Roen* thus compose the diesel excavating team which Marine Operators is backing as their contestants in the race vs. time and rock. Due to its unique design, employing so many drills and multiple high-speed diesel engines, the *Hornet* especially is attracting the close attention of engineers and contractors across the nation. Besides this equipment Marine Operators will also employ a 6 yd diesel dragline to unload their rock barges and build compensating dike.

The Great Lakes Dredge and Dock Company, on their 2½-mile southern portion of the Amherstburg Channel are employing a steam-operated drilling barge, a diesel dipper dredge, and a diesel tugboat. While approximately 90% of the Marine Operators' territory will require blasting, about ⅓ of the excavating done by Great Lakes Dredge and Dock Company can be done without blasting. GLD and D also have the advantage of being able to place heavier charges (shooting on 10-foot centers instead of 8) and of being allowed to fire two sets of drill holes—24 in all—at one blast. For their drilling barge, GLD and D are using the *M-1*, a 140 ft x 35 ft x 8 ft (with 5 ft draft) barge built by Manitowoc Shipbuilding Co. and fitted out with 4 Ingersoll-Rand SP-8, 4½" bit, submarine drills, steam operated. The *M-1* carries a 435-506 hp scotch marine boiler installed by Johnson Brothers of Ferrysberg, Michigan. The drills are mounted on four frames which are each capable of being moved to 3 positions, so that the *M-1* can drill 12 holes and set 12 blasting charges without being moved. To excavate the workable silt bottom without blasting and to remove material after blasting by the *M-1*, GLD and D is using a giant dipper dredge, the 12 cu yd *Mogul*. The *Mogul* is 156 ft long, 42½ ft wide, and 13 ft deep with 9½ ft draft. It is powered by an 8 cylinder, 13" x 16½" bore and stroke, 1100 hp at 300 rpm Nordberg diesel, and has a 65 ft dipper stick. A 12 yd bucket is used for loose material, an 8 yd bucket for rock. The *Mogul* is mounted on a steel hull but has a wood superstructure containing crew's quarters. Since the spoil from the GLD and D operation is to be dumped instead of being used for dikes, the *Mogul* will be serviced by two 1500 cu yd all steel dump scows, each 224 ft by 43 ft by 13 ft deep. First plans were to use their own 94 ft x 26 ft x 28 ft molded depth diesel tug *Gaynor*, powered by a 1400 bhp Cleveland Diesel-Electric engine, but the *Gaynor* has since been moved to the Middle Neebish Channel on the St. Marys River. The Amherstburg tug *Atomic* which is also diesel will replace the *Gaynor*. Although deepening the Amherstburg Channel is the first and most expensive phase of the Great Lakes Connecting Channels Projects it represents only a portion of the widespread activity which the project will entail. The U. S. Army Corps of Engineers has made a detailed study of the location, size and past performance of all the heavy dredging equipment in the Great Lakes Area and are watching closely the equipment so far employed. We believe the project will turn out to be largely a diesel job and one which the proponents of diesels can be proud of for many years to come.

The *John Roen*, 77-ft Superior diesel towboat which will convey laden deck-barges from the *Samson* to compensation dikes for unloading. Just behind the *John Roen* are 2 Ingersoll-Rand 600 cfm, GM Diesel powered air compressors and one of the massive (3 ft 8 in. x 3 ft 8 in. x 47 ft) air-operated spuds which anchor the *Samson*.

Great Lakes Dredge and Dock Company's steam-operated drilling barge with 4 Ingersoll-Rand submarine drills which yield 12 holes per "sitting".



The *Samson*, Marine Operators' 12 cu yd, 160 ft boom dragline, powered by an 8-cylinder Cooper-Bessemer, is a diesel-electric rig. Just arrived at the job, it is shown doing a "trial run".

USE OF RESIDUAL OIL AS DIESEL FUEL

Subject Matter of This Article is so Important, of so Much Immediate Interest to Many, Many Users of Diesel Engines, That We are Running it as Written–Full Length. This is Chapter One, The January Issue Will Bring You Chapter Two and the February Issue Chapter Three. The Author is Known for His Research and Practical Experience on This Subject from One End of the Industry to the Other.

By EDWARD B. RAWLINS*

THE use of residual fuels, could cover many phases of operation if explored to its entirety. It could, for example, cover the use of residual fuel as a boiler fuel. It could go into the field of asphalt production in which residuals are converted to petroleum asphalt for highway construction. It could discuss the process in which it is converted to petroleum coke. However, in this article discussion will be conjured to the use of residual fuel as a diesel fuel. Running diesel engines on residual fuels is by no means new. Diesel power plants have been operating on these fuels in this hemisphere for the past several years. Dr. Diesel, in the development of the diesel engine, thought of his development not as an engine to run on a liquid fuel, but as an engine to convert powdered coal into power directly by burning coal in an engine cylinder. The problems encountered in this venture were many. The principle ones were getting the fuel into the cylinder in the proper quantities and at the proper time and the disposal of ash.

Following the failure to surmount the problems of using a dry fuel, liquid fuels were resorted to and have been successfully used to this day. In the early days of the diesel engine, fuels, as we know them today, did not exist. All diesels operated on what we would term heavy fuels–namely, crudes, heavy gas oils and residuals. The diesel fuel as we know it today was a later development. It resulted from the use of furnace or heating oils as a fuel for diesel engines. This use of lighter fuels resulted from the necessity for a better fuel for diesel engines as diesels got smaller and crankshaft speeds increased. The first diesels and those that originally operated on the heavier fuels were large, slow speed, air injection engines that could run on almost anything that could be blown into the cylinder. That these early engines ran on these fuels was not a matter of economics as we think today, but one of necessity. If they could not have run on these low grade fuels, they would not have run. Simply, there was no other fuel available.

As time went on, the use of lighter fuels became the rule and the use of heavier fuels was discarded in favor of the cleaner, easier to handle distillates. Furnace or heating oils, in the beginning, supplied the wants of the diesels and many engines are, today, giving good operation on these fuels. It should be noted at this point that of all the refined fuel oil produced today, the greater part of the distillate and cracked fuels or blends of the two are marketed for heating service, only about 20% being used for diesel service. A few years ago, consideration of the lower grades of petroleum fuels, as a diesel fuel was brought to the front for economic reasons. Credit for the successful conversion and operation of diesel engines on residual fuels must go to Mr. John Lamb, Manager of the

Engineer–Fuels and lubricants, The Cooper-Bessemer Corporation

Heat of Combustion of Crude Oils, Residual Fuels, Fuel Oils & Kerosenes

Gravity			Density	Total Heat of Combustion at Constant Volume=Q_v. (High Heat Value)	
Degrees API/60°F	Degrees Baume/60°F	Specific Gr. 60°/60°F	Pounds per Gal.	BTU/Lb.	BTU/Gal.
0	10.241	1.0760	8.962	17940	160800
1	9.219	1.0679	8.895	18010	160200
2	8.194	1.0599	8.828	18070	159500
3	7.167	1.0520	8.762	18140	158900
4	6.151	1.0443	8.698	18200	158300
5	5.119	1.0366	8.634	18260	157700
6	4.100	1.0291	8.571	18320	157000
7	3.079	1.0217	8.509	18370	156300
8	2.044	1.0143	8.448	18430	155700
9	1.022	1.0071	8.388	18490	155100
10	10.000	1.0000	8.328	18540	154400
11	10.989	.9930	8.270	18590	153700
12	11.979	.9861	8.212	18640	153100
13	12.968	.9792	8.155	18700	152500
14	13.958	.9725	8.099	18750	151900
15	14.947	.9659	8.044	18790	151100
16	15.936	.9593	7.989	18840	150500
17	16.926	.9529	7.935	18890	149900
18	17.915	.9465	7.882	18930	149200
19	18.905	.9402	7.830	18980	148600
20	19.894	.9340	7.778	19020	147900
21	20.883	.9279	7.727	19070	147400
22	21.873	.9218	7.696	19110	146700
23	22.862	.9159	7.627	19150	146100
24	23.852	.9100	7.578	19190	145400
25	24.841	.9042	7.529	19230	144800
26	25.830	.8984	7.481	19270	144200
27	26.820	.8927	7.434	19310	143600
28	27.809	.8871	7.387	19350	142900
29	28.799	.8816	7.341	19380	142300
30	29.788	.8762	7.296	19420	141700
31	30.777	.8708	7.251	19460	141100
32	31.767	.8654	7.206	19490	140400
33	32.756	.8602	7.163	19520	139800
34	33.746	.8550	7.119	19560	139200
35	34.735	.8498	7.076	19590	138600
36	35.724	.8448	7.034	19620	138000
37	36.714	.8398	6.993	19660	137500
38	37.703	.8348	6.951	19690	136900
39	38.693	.8299	6.910	19720	136300
40	39.682	.8251	6.870	19750	135700
41	40.671	.8203	6.830	19780	135100
42	41.661	.8156	6.790	19810	134500
43	42.650	.8109	6.752	19840	134000
44	43.640	.8063	6.713	19860	133300
45	44.629	.8017	6.675	19890	132800
46	45.618	.7972	6.637	19920	132200
47	46.608	.7927	6.600	19950	131700
48	47.597	.7883	6.563	19970	131100
49	48.587	.7839	6.526	20000	130500

Table 1

Research and Development Department of the Anglo-Saxon Petroleum Company, Ltd. Mr. Lamb's conversion of the MV *Auricula*, MV *Dromus* and others developed a successful operation at considerable savings. These motor vessels bunkered at various ports throughout the world, with the result that many different fuels were taken aboard. These fuels varied in viscosity from about 75 ssf @ 122°f to about 140 ssf @ 122°f, and some contained up to nearly 3% sulphur. Today there are several hundred motor vessels operating on residual fuels. Additional conversions are constantly being put into service. It is true that the engines Mr. Lamb had to work with were large, slow speed units that more readily lent themselves to conversion to heavier fuels than the medium and higher speed engines we will cover in this discussion.

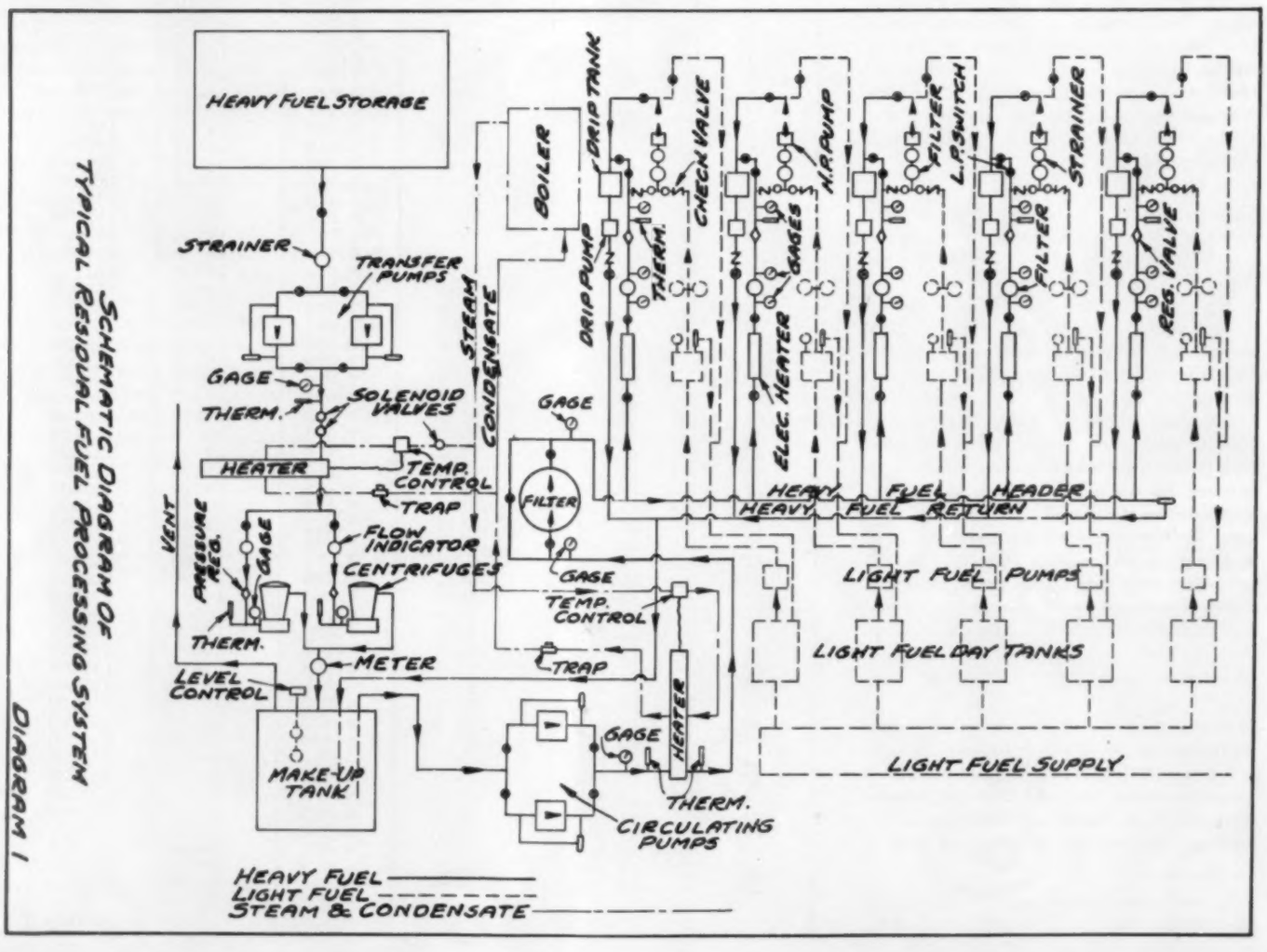
About eight years ago, the first medium speed stationary power plant installation designed specifically for residual fuel was put in service for the Nantucket Gas and Electric Company, Nantucket, Massachusetts. This engine was a 13" x 16", 8-cylinder, 4 cycle Cooper-Bessemer engine running at 400 rpm. Prior to this time, however, many of these same size engines had been in operation as auxiliaries on some of the Sun Oil Company's tankers using the same fuel as the main engines which generally was whatever fuel cargo they were carrying. Following this installation, another using the same size Cooper-Bessemer engine, but in variable speed service up to 514 rpm was made at the Virginia Smelting Company, West Norfolk, Virginia. Two additional units at 514 rpm have since been installed.

Conversions of the existing plants of the Clay Electric Cooperative at Keystone Heights and Worthington Springs, Florida, and the Agralite Cooperative at Benson, Minnesota, were made so that advantage could be taken of price difference between distillate and residual fuels. A five engine power plant has recently been installed near Havana, Cuba, to operate on residual fuels. This installation consists of 5 Cooper-Bessemer model LS-8, 15½ x 22, 4 cycle units in generator service at 327 rpm. Still another installation of four 12-cylinder, 15½ x 22, 4 cycle generator units is in service at the Eldorado Mining and Refining Co., Ltd., Uranium City (Beaver Lodge), Canada.

Due to factors beyond our control, serious consideration should be given to the possibility of the conversion of diesel engines by all diesel plant managers whose plants are dependent on diesel fuel. Similar consideration should be given to any new diesel plants constructed and they should only be put in on the basis of possible residual fuel operation. This statement is based on the fact that should a national emergency arise, all available diesel fuel will be required for conversion to jet fuel for the armed services. This whole problem is at present under intense study by various federal agencies including the armed services. Diesel operation on residuals could be the only operation available during such an emergency. The operation of diesel engines on residual fuels poses some problems but they are not insurmountable. The following discussion has been designed to help bring a better understanding of these problems.

Before taking up actual residual fuel processing and operation, it would be well to outline an understanding as to what our modern residual fuels are, their various characteristics as evidenced by the various typical tests and specifications as well as the possible effect of these properties on diesel engine operation as they may vary with different fuels. Residual fuels as we encounter them today are a far different product than we had to deal with only a few short years ago. Due to the increasing demands, imposed on the petroleum industry for more and higher octane gasolines and more and better distillates and cracked fuels for heating and diesel services, it has been necessary to produce more of these products from each barrel of crude. Residual fuel formerly accounted for about 30% of each barrel of crude refined while

See text in Chapter 2 in next issue.



SCHEMATIC DIAGRAM OF TYPICAL RESIDUAL FUEL PROCESSING SYSTEM

DIAGRAM 1

today the residual fuel from a barrel of crude is only about 10% of each barrel.

Not only is the percentage of residual from each barrel of crude getting less as time goes on, but the quality of the end product is getting poorer. A few years ago we fed a barrel of crude to a fractionating tower, and received from this unit straight run gasoline, naptha, kerosene (basic material for No. 1 fuel), gas oil (basic material for No. 2 fuel), wax distillate, lubricating oil distillate and residual fuel or still bottoms. These classifications are very broad and could be broken down into many other specialized products familiar to all of us. However, elaboration of this phase is beyond the scope of this discussion. This process left something around 30% of residual fuel which in itself was an excellent diesel fuel, not too hard to process and handle. The fuel likewise was reasonably clean. The refining process supplied us with straight distillates from which our gasoline, fuel oils and lubricating oil was produced as well as a good residual fuel that was not too heavy gravity-wise or too viscous. As time went on, however, the demand for better gasolines and fuel oils exceeded what was available from our crude production refined by the old distillation process. This led to the development of the various cracking processes in an effort to get more refined products from each barrel of crude. The good residual that we had available from the earlier refining processes now became, along with some of the other cuts, a charging stock for the cracking unit. This resulted in increased production of fuel and gasoline but reduced our residual yield per barrel to about 10%. This 10% of residual fuel has now become a very heavy, very viscous and very dirty fuel. Before it can be readily used, even as a boiler fuel, it must be modified by cutting it back with refinery scrap, kerosene slops or gas oil. This is the type of residual fuel that we have to contend with today. These residuals are apt to be unstable in storage, usually have a high ash content which contains many different trace elements. In spite of their being cut back they may be low in gravity and quite viscous. Some of the trace elements found in the ash of all residuals are Calcium, Sodium, Vanadium, Silicon, Iron, Aluminum, Nickle, Manganese, Chromium, Potassium, Cobalt, Titanium, Magnesium, etc. These traces of the different elements for the most part are harmless. However, some of them can become quite troublesome. This is particularly true of vanadium, sodium, and calcium, and a little later in the discussion these troubles will be taken up at greater length.

Since residual fuels cover such a wide range in quality and specification, if we are going to use them as diesel fuels, it is necessary to put some kind of a limiting specification on residuals to be used as diesel fuel. Such a limitation should not be so tight as to affect the fuel cost materially but tight enough to provide fuels that are suitable for diesel operation. A limiting specification that has been found to be suitable, will permit the use of about 90% of the available residual as diesel fuels. The ASTM limits on these No. 5 and No. 6 fuels are not suitable for diesel fuels in that they are too broad. The following limiting fuel specification should provide an ample selection of fuels suitable for diesel operation.

RESIDUAL FUEL LIMITING SPECIFICATIONS

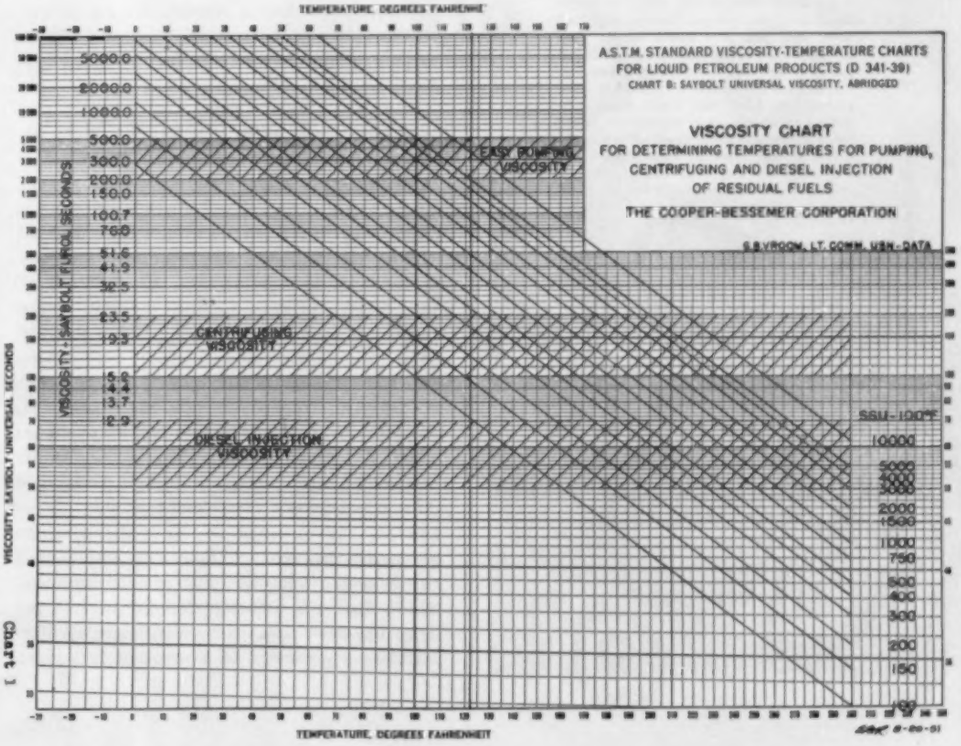
Gravity—A.P.I. @ 60°f	11 min.
Viscosity—ssf @ 122°f	200 max.
Conradson Carbon—%	12 max.
Sulphur—%	3½ max.
B.S.&W.—% by centrifuge	2 max.
Flash—°f	150 or legal
Ash—% of cleaned fuel	.1 max.
Vanadium—ppm	70 max.
Vanadium Pentoxide—ppm	125 max.
Calcium—% of ash	10 max.
Sodium—% of ash	5 max.

A discussion of the above limits at this time is in order, that we may understand why they have been established and what possible effect they may have on the operation and maintenance of the diesel engine using them.

GRAVITY—The API gravity of residual fuels may vary from as low as 3 or 4 to as high as 17 or 18. Actually gravity has little effect on the fuel except as the gravities go down the btu content per gallon of fuel goes up. (See Table 1). API gravity is not tied in nor can it be correlated with the viscosity of the fuel. As a general rule, low gravity fuels are more viscous, yet it is entirely possible to have a low gravity with a low viscosity and by the same token a high gravity fuel with a high viscosity. Refining processes have an effect upon the gravity/viscosity ratio, residuals from thermal cracking units usually being more viscous than those from a catalytic cracking process and both exceeding residuals from a fractionating tower. Gravity can be taken generally as a guide to fuel quality when considering residuals as fuels for diesel engines. The lower gravity fuels are generally dirtier and have a high Conradson Carbon content. Gravities lower than 10 are heavier than water and those above 10 are lighter than water. The minimum of 11 API gravity at 60°f was selected as about the minimum at which water could be readily centrifuged from the fuel. Although lower gravity fuels can and have been used as diesel fuel, their use has generally been confined to the larger, slow speed units.

It is always wise to avoid fuels much heavier than 11 gravity. They are usually dirtier, high in carbon and asphaltines, more viscous and hard to process. They usually result in poorer engine operation. Viscosity limits according to ASTM standards permit a wide range of viscosity, from 45 to 300 ssf @ 122°f for a No. 6 fuel and from 40 ssf @ 122°f down to 150 ssv @ 100°f for a No. 5 fuel. Viscosities of some Bunker C fuels are often much higher, ranging up to several hundred seconds saybolt furol at 122°f. 200 ssf @ 122°f has been established as the viscosity limit for fuels to be used as fuel for diesel engines. Fuels of a more viscous nature tend to be of a lower grade. They are usually dirtier and require more heat for their preparation and burning. This limitation at the present time embraces 80 to 90% of the available residual fuels. When selecting a residual for use as a diesel fuel, it is always advisable to select one that is low in viscosity. Viscosities in the range of 100 to 150 ssf @ 122°f or lower if possible, are desirable because they are easier to process and require less heating than the more viscous fuels.

Chart I gives the temperature requirements necessary to provide proper pumping, centrifuging, and diesel injection viscosities. The market today still provides some selection of fuels less viscous than mentioned above. This picture, however, is not apt to remain. As crudes are cracked down further, the resulting fuels will be of a more viscous nature and in some respects lower grade. There is no established limit for Conradson carbon in a residual fuel. Crude source and the degree to which it has been cracked down determines the carbon content of the residium. Although many fuels will be encountered that have a carbon content of 5 to 8%, fuels will be found that have a carbon content as high as 17 or 18 percent. If possible, in selecting a residual for use as a fuel, one low in carbon should be chosen. The lower the carbon


TEMPERATURE, DEGREES FAHRENHEIT
A.S.T.M. STANDARD VISCOSITY-TEMPERATURE CHARTS FOR LIQUID PETROLEUM PRODUCTS (D 341-39)
CHART B: SAYBOLT UNIVERSAL VISCOSITY, ABRIDGED
VISCOSITY CHART
FOR DETERMINING TEMPERATURES FOR PUMPING, CENTRIFUGING AND DIESEL INJECTION OF RESIDUAL FUELS
THE COOPER-BESSEMER CORPORATION
EASY PUMPING VISCOSITY
CENTRIFUGING VISCOSITY
DIESEL INJECTION VISCOSITY
VISCOSITY, SAYBOLT FUROL SECONDS
VISCOSITY, SAYBOLT UNIVERSAL SECONDS
SSU-100°F
CHART 1

content, the easier to get complete combustion of the fuel, maintain a clean exhaust and a clean engine. The selection of 12% as the maximum limit for Conradson carbon was based largely on experience in the burning of residual fuels in diesel engines. Fuels containing in excess of 12% carbon were inclined to run with a dirty exhaust and dirtier overall operation. Most of the available fuels offered on the market today fall within the limits established.

Due to the slow burning qualities of the carbon in the fuel, little is gained powerwise from this source. While the heat value of the fuel determined by a calorimeter includes that of any carbon present, little energy is realized from this source. Specific fuel consumption will be higher on a btu basis than with fuels with little or no free carbon, such as distillates. Even though there might be 15000 more btu's in a gallon of residual fuel than in a gallon of distillate fuel and more kw's per gallon realized from the residual fuel, the proportion between the two fuels will not be realized. As a result of laboratory checks it has been determined that specific fuel consumption guarantees must be revised upward .8% for each 1% of Conradson carbon in the fuel in excess of 2%. *SULPHUR*—Sulphur in a fuel, even high sulphur fuels, can be handled without too much distress. This is providing that known operating practices are followed to successfully cope with it. It is on this assumption that the limit of 3½% was established. Very few residuals exceed this limit although there are some that may go 4½ to 5% or even higher. Generally, however, the sulphur content will be some place between ½ and 2%, so the 3½% limitation permits the use of the majority of the fuels on the market.

Operation with jacket water and lubricating oil temperatures of 175°f or 180°f, or above will do much to keep sulphur effects to a minimum. Operation above the dew point, which means a temperature on the surface of the liners and pistons of at least 194°f at atmospheric pressure, is necessary if condensation is to be checked. Without condensate to unite with the sulphur oxides, the harmful sulphuric and sulphurous acids cannot form to cause corrosion and acidify the lubricating oil. Under conditions of proper operation, high sulphur fuels can be handled without deleterious effect. For those services, however, that for one reason or another must operate at lower temperatures, sulphur is a problem and fuels with a low sulphur content should be selected. As already mentioned, most residuals have sulphur contents of from ½ to 4½ or 5%. Very few on the extremely high side. However if we are going to burn these fuels as a diesel fuel, we are going to have to cope with them. The Europeans have operated with high sulphur content fuels for many years with success. It should probably be pointed out that crudes from some foreign areas are higher in sulphur than our domestic crudes. This means that when we have to use residuals from foreign sources, consideration must be given to the probability that the particular fuel has a high sulphur content. Some residuals are imported from foreign sources and are available on our domestic markets.

B.S.&W. BY CENTRIFUGE—The ASTM limit on water and sediment in a No. 6 fuel is 2%. This means that the amount of water by distillation and the amount of sediment by extraction will not exceed 2%. It is not often that this figure will be reached. The majority of fuels have a water and sediment content of a fraction of 1%. The limit, as established, of 2% may seem high, but it was decided upon to avoid penalizing an otherwise good fuel due to centrifugable dirt. For an operator, using a residual as a diesel fuel, the lower the water and sediment content, the less he will have to service his centrifuges. The easier will be his preparation problem. For this reason, if it is possible, select fuels with low water and sediment content. With higher water and sediment contents, centrifuges will have to be serviced oftener. Usually, the B.S.&W. will run somewhere between .1% and .5%.

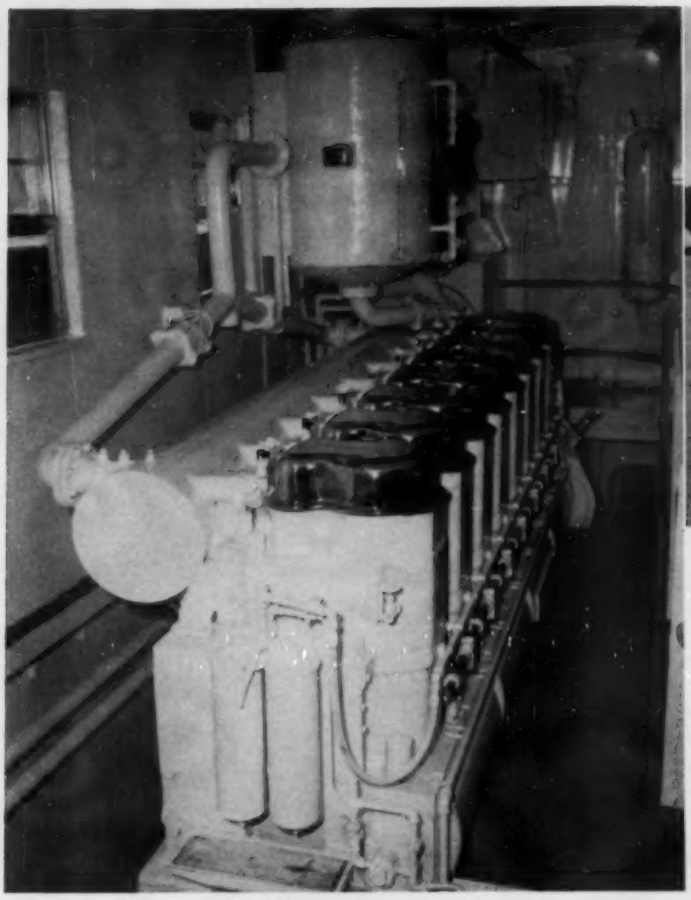
FLASH—The flash point established meets legal requirements and does not penalize a fuel containing a lot of kerosene slops or scrap fuel oil, often disposed of by mixing it with residual stocks. Usually the flash point will average 200°f to 275°f. *ASH*—All residuals contain a soluble ash that cannot be removed. This ash consists of organic salts of various metals and perhaps salt. It contains no carbonaceous matter. The raw fuel also contains other ash producing contaminants. Since they are removed by the centrifuges in the preparation of the residual for use as a diesel fuel, they can be ignored. The processed fuel, in addition to the soluble ash, however, will have a small amount of ash from the finely divided colloidal sediment. This sediment is dispersed through the fuel and is too fine to be removed by centrifuging or filtering. The ash content of a prepared fuel represents about 60 to 65% of the total ash from an unprocessed fuel. Ash reduction in the processing operation, of 35 to 40%, should be regarded as excellent. It is reasonable, therefore, to expect an ash in the fuel after processing of .01 to .05 percent. The ash limitation of .1% after processing permits the use of all but the lowest grade fuels.

VANADIUM & VANADIUM PENTOXIDE—Vanadium and Vanadium Pentoxide appear in most residual fuels to a greater or less extent. The permissible amount of vanadium pentoxide (V_2O_5) at the limit of 125 ppm has been established solely on the basis that we have been able to handle that much without difficulty. Where vanadium in excess of 70 ppm (vanadium pentoxide—125 ppm) has been experienced in fuels used in diesel engines, the result of its presence is evidenced by the corrosion of parts subjected to temperatures in excess of approximately 1250°f. The exhaust valves of 4 cycle engines are one point of attack. (See figures 1 and 2). The figure of 70 ppm of vanadium (V) is the equivalent of 125 ppm of vanadium pentoxide (V_2O_5). In choosing residuals for use as a diesel fuel, those with a minimum amount of this element present should be selected. In no case should a fuel containing an amount greater than the limit established be used.

As a general rule, the vanadium problem with fuels from domestic sources is negligible. It is only when fuels or blends of fuels from high vanadium sources such as Venezuela are encountered that vanadium becomes a real problem. There is no known easy method of processing the fuel for removal of this troublemaker. However, a great deal of effort is being expended on the problem along several lines. It is not unreasonable to expect material help in the solution of the problem in the near future. Vanadium pentoxide is the stable form of the union of vanadium and oxygen with a melting point of 1274°f. It is in the plastic or molten state that vanadium pentoxide is active. In this state it is an almost universal solvent attacking all engine construction materials and alloys without partiality.

Figure 1—
Exhaust valve from an engine using a fuel that was excessively high in vanadium. Ash runs .053% or 530 ppm of the fuel. Vanadium content of the ash is 40% or 212 ppm of the fuel. It should be noted that the points of excessive attack are not washed out as would be with blow-by. The corroded places are quite deep. It is thought that strong concentrations of Vanadium Pentoxide had accumulated at these points. To the right of these two pits is a much larger area of corrosion of the same type that appears either not to have progressed as far or was attached by a weaker concentration. Had this valve been permitted to continue in operation, blow-by would have destroyed all evidence of the type of corrosion.

Figure 2—
Another valve from same engine but attached to a lesser degree. Valve shows a considerable build-up of a deposit proved to be primarily calcium and sodium.



View in engine room showing the port Enterprise Main Engine with its Vapor Phase Unit, Winslow Filters and Amot Controls.

M.V. *HAMILTON*

By W. L. BODE

THE M. V. *Hamilton*, the newest and most powerful towboat designed for the Illinois River, was christened in St. Louis on September 17, 1957. Designed and built by the St. Louis Shipbuilding & Steel Co. for the Suffolk Marine Corporation, the 2560 hp twin screw *Hamilton* will push the inland rivers' first integrated multiple chemical tow from Texas to the Chicago area, under charter to the Canal Barge Company, Inc. With many out of town guests looking on, the new vessel was christened by Miss Susan P. Jones, daughter of Joseph M. Jones, President of Canal Barge Company, Inc. The *Hamilton* was named for the grandfather of the sponsor, the late Dr. Hamilton Polk Jones of New Orleans.

The 128 ft long by 35 ft wide vessel is constructed for rugged service with both longitudinal and transverse framing. Extremely long tunnel lines permit an easy flow of water to the propellers. The M. V. *Hamilton* is powered by two Enterprise marine engines, model DMG-38, each rated 1280 hp at 600 rpm. With Falk Reverse-Reduction gears, the stainless steel propellers turn 240 rpm. The main engines are equipped with "Vapor Phase" cooling, a patented system which maintains a constant temperature of up to 250° or more throughout the entire engine and throughout a wide range of engine load. This constant high temperature reduces wear, reduces corrosion and helps to eliminate lube oil sludging. In addition to reducing engine maintenance, the "Vapor Phase" installation on the M. V. *Hamilton* furnishes low pressure steam at no cost for the heating coils in one of the chemical barges. Electric power is provided by two General Motors, Detroit Division, 60 kw ac generator sets. Generator control and power distribution is through a Central Electric Co. dead front switchboard. A Century Electric Co. motor-generator set provides direct current for the arc searchlights. The *Hamilton* is equipped with two St. Louis Ship mechanical-hydraulic steering systems, one for the two steering rudders and one for the four flanking rudders.

A 100 gpm, 7½ hp Weinman Fire Pump supplies three fire hose outlets, and a 100 gpm, 5 hp Carver Bilge Pump has suction connections from all compartments. One ¾ hp Gould's Pump provides for the efficient transfer of fuel oil between bunkers. Two 23.5 cfm Quincy Air Compressors driven by 5 hp motors provide for main engine starting, Airflex clutches and air whistle. All living quarters of the *Hamilton* are year round air conditioned by means of a centrally located Trane air conditioning unit providing hot or cold air through a common duct. A Schoellhorn-Albrecht double barreled 10 hp capstan and two 40 ton Nabrico hand winches are located on the forward deck. Century Electric Co. motors and Cutler-Hammer controls are used on the auxiliaries. The modern deckhouse is extremely spacious for a single deck Illinois River boat. It is of all welded steel construction with a steel partition at the forward and aft ends of the engine room. All surfaces exposed to the weather are insulated with 2" thick Ultralite insulation and the lining and partitions throughout are ¼" tempered Masonite. The mess and lounge are attractively decorated and the lounge is provided with television.

The M. V. *Hamilton* should prove to be a worthy addition to the expanding fleet of the Canal Barge Company, Inc.

The retractable pilot house is mounted on an hydraulic cylinder having a lift of 9'-8". This exceptionally high lift gives the pilot excellent vision over his tow, and when lowered gives the *Hamilton* a maximum height above the waterline of 16'-0".

DIESELS MOVE TRANSCON LINES AHEAD

Young, Expanding Long Haul Trucker Relies on Diesels for Present Profits and Future Growth.

By BRUCE W. WADMAN

TRANSCON Lines, a 10 year old newcomer to a 54-year-old industry, today is one of the nation's leading transcontinental highway motor carriers, its fleet of diesel tractors and trailers rolling up approximately 18,000,000 miles a year in cross country operations in a 13 state territory. Gross revenues in 1956 topped $9,000,000 compared with $6,562,921 in 1955. Net income was more than $1,000,000, almost double the 1955 figure of $531,297. Dividends paid that year, regular and special amounted to $1.70 per share, compared with 70 cents a share in 1955. The company employs 785 persons, including 335 drivers, and has a payroll of approximately $4,500,000 a year. Transcon is a unique truck line in that it was a planned venture long before it had a single piece of equipment on the highways. In 1946, Scribner Birlenbach, Transcon's founder and president, visualized a transcontinental motor freight line linking major West Coast industrial areas with production centers throughout the country with cargoes moving "straight through" from shipper to receiver. That year, he acquired operating rights between Los Angeles and Oklahoma City and Kansas City, Missouri, commissioned Raymond Loewy, famed industrial designer, to draft the attractive red, white and black T/C symbol now used on all equipment, and Transcon Lines was in business.

Since then, the Interstate Commerce Commission has authorized the company to extend its routes from Kansas City to Chicago, from Los Angeles to the Oakland-San Francisco Bay area, and from Oklahoma City to Memphis, from San Francsico and Bay area to Dallas and Fort Worth and surrounding points. Even now, it has petitions before the I.C.C. for permission to serve shippers in St. Louis, and to extend its routes on from Memphis to Birmingham and Atlanta. Over this wide-spread system, company equipment moves "straight through" from shipper to receiver. Transcon employs sleeper cab operations with two drivers to each tractor. This permits one driver to sleep while the other drives for over the road runs from point to point without stop, except for brief maintenance stops. To achieve an economical and consistent operation, and to maintain fast schedules throughout its entire over-the-road system, Transcon, through the leadership of its Chief Engineer, George W. Pratt, has ordered and put into service the past few years 127 specially designed White Model WF 75625TP Freightliner three axle line tractors with high capacity semi-trailers. These Freightliners contain design features of light weight and economical space allotment that permit a higher cube trailer to be used. The Freightliner tractor semi-trailer combination vehicle weight is 22,000 lbs, and with a legal gross vehicle weight limit of 60,000 lbs these trucks can carry a 38,000 lb payload, while continuing to meet the size and weight laws of the different states in Transcon's routes. The cab has a 75 in. depth including sleeper compartment with inner spring mattress. Cab heaters and defrosters and cab coolers are installed for driving, sleeping comfort and safety. The semi-trailer vans have a 2270 cu ft volumetric capacity. Lighting and general safety equipment are installed beyond legal requirements to assure for maximum operational safety.

Each Freightliner is powered by a Cummins naturally aspirated NHB-600 diesel, rated 200 hp at 2100 rpm, driving through a Fuller 5C72 transmission. Each Cummins engine is equipped with Vortox oil bath type air cleaner, Cummins-Nugent fullflow engine oil filter in engine oil pan, Cummins-Fram fuel oil filter, Aeroquip flexible fuel, air and oil lines. Transcon follows a very interesting method of engine operation to obtain the maximum in fuel economy and lowest maintenance costs on their diesels. All Cummins engines are set at a maximum speed of 2000 rpm and hp output of 165 and all vehicles are limited to a maximum speed of 50 mph. This type of operation is made possible by the careful integration of vehicle design, prime mover, and analysis of routes to permit schedule requirements to be maintained effectively and competitively. Careful records are kept of the operation of each unit. First of all, each tractor is equipped with two Wagner Electric Sangamo tachographs; one with warning light and chart recording miles per hour, and one with warning light, tachometer and chart recording engine rpm. Secondly, a separate worksheet detailing each tractor's operation is kept in the terminal. This all adds up to a consistent day to day check on all equipment to assure most advantageous operation of equipment, maximum safety, and maximum insurance against road failures. Terminals are operated in Los Angeles, Oakland, Oklahoma City, Dallas, Fort Worth, Phoenix, Chicago, Kansas City, Ponca City-Arkansas City, Tulsa, Fort Smith, Little Rock and Memphis. Main administrative offices are at 1206 S. Maple Ave., Los Angeles. However, central dispatching, repair and maintenance divisions are at Oklahoma City, which is the operating hub of the entire Transcon system. The Oklahoma City shops are equipped with facilities to perform complete overhaul on engines and trucks, and contain a Clayton chassis dynamometer for checking and adjustment of power units to peak performance. A preventive maintenance program of periodic inspection, overhaul and adjustment of units is followed as standard practice. As Transcon Lines moves ahead, its success and growth points out the advantages of detailed and sound planning of equipment design around the diesel prime mover, and close control of equipment operation in the field. Additional equipment used on the Freightliners is as follows: Clutch—Spicer 14 in. two plate; Drive axle—Timken two speed; Third axle—Shuler pusher type.

Two views of the fine new fleet of diesel Freightliners. 127 of them designed by White Motor Company and each powered with a Cummins NHB-600 diesel rated 200 hp at 2100 rpm, driving through a Fuller transmission. Each Cummins diesel is equipped with a Vortox oil bath air cleaner, a Nugent full-flow engine filter, a Fram fuel oil filter and Aeroquip flexible fuel, air, and oil lines.

transcon

WHAT'S GOING ON IN ENGLAND

CONDUCTED BY **BERNARD W. LANSDOWNE**

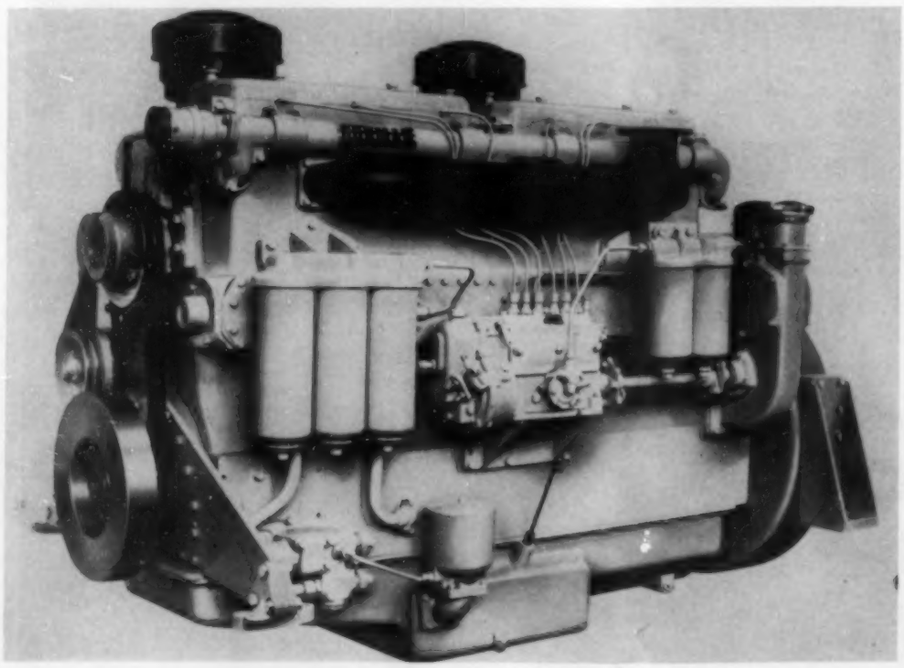
Bernard W. Lansdowne is an associate member of the Institution of Mechanical Engineers and is widely known among British and European diesel manufacturers as a former editor of our English contemporary "Gas & Oil Power." His early workshop training was spread over seven years with A.E.C. Ltd., Southall, following which he served some five years with that company's sales engineering department. He is now specializing in industrial advertising with Roles & Parker, Ltd. in London.

Dorman's New General Purpose Design

THE second new series of diesel engines to be introduced by W. H. Dorman & Co. Ltd. of Stafford within the past year or two, made its appearance recently when the first of the new models was exhibited in London. Known as the Q range, the new engines are designed in sizes providing a power range which begins where the Company's earlier L series terminated, so that today the Stafford firm can offer units from 20 hp up to 700 hp from two virtually new ranges. The Q series are to be available with 5, 6, 8 and 12 cylinders, the latter two, which are not yet in production, being in VEE form. They are to be produced in naturally-aspirated, pressure-charged and turbo-charged forms. The 5 and 6 cylinder units will also be built for vertical or horizontal mounting. The larger VEE designs are available for marine propulsion and auxiliary duties and the complete range is applicable to a wide variety of general industrial duties.

The almost square cylinder dimensions of 6¼ in. bore by 6½ in. stroke give a swept volume per cylinder of 199.2 cu in. (3.26 litres) and the mean piston speed is 1,940 feet per minute at 1,800 rpm. Referring in detail to the in-line models, a single piece iron casting forms the crankcase and cylinder block, a conventional sump cover providing access to the main bearings and big ends. Detachable side doors in the crankcase also give access to the running components. The crankshaft is an alloy steel stamping with induction hardened pins and journals. It is carried in underslung copper-lead lined main bearings of 4¾ in. diameter, copper-lead also being used for the 4¼ in. diameter big ends. The H section connecting rods have diagonally split big ends to facilitate the upward removal of pistons through the cylinder liners. The liners are of the wet type with chrome hardened bores. The pistons are in low expansion light alloy and a toroidal cavity is machined in the crown to form the combustion chamber. Each piston carries three pressure and two oil control rings and is secured to the connecting rod by 2½ in. diameter case-hardened alloy steel gudgeon pins.

New Dorman six cylinder diesel producing 237 bhp naturally aspirated.



Each cylinder head covers either two or three bores, according to the engine size, and they are fitted with renewable valve seats and guides, both the seats and valves being stellite faced to provide long life. The heads carry an aluminum rocker box and cover in which a decompression mechanism is fitted. The engine exhaust ports are on the left hand side of the engine and leave the cylinder head as single or siamesed units dependent upon the cylinder head arrangement. A two piece cast iron exhaust manifold is employed with a central upturned outlet. The two halves of the manifold are joined together by a labyrinth expansion joint.

Engine lubrication is by a gear type pump which draws oil through a flat rectangular oil strainer fitted in the sump. Oil is fed via an adjoining plunger-type externally-fitted relief valve and a triple element full flow filter. These are of the replaceable impregnated paper element type and both the filters and the relief valve are situated accessibly on the left hand side of the engine. Incorporated in the relief valve body is an oil cooler by-pass valve and in addition to the full flow oil filter a by-pass filter of the centrifugal type is provided in the lubrication system. The object of this second filter is to increase the life of the full flow filter to the absolute maximum and at the same time remove impurities which are normally missed by the element type filters. Engine cooling is on conventional lines with a belt driven water pump mounted on the right hand side of the engine. A belt driven fan is also provided and fans up to 30 in. diameter can be supplied and fitted to the fan hub. Where larger fans are necessary these can be mounted in the radiator.

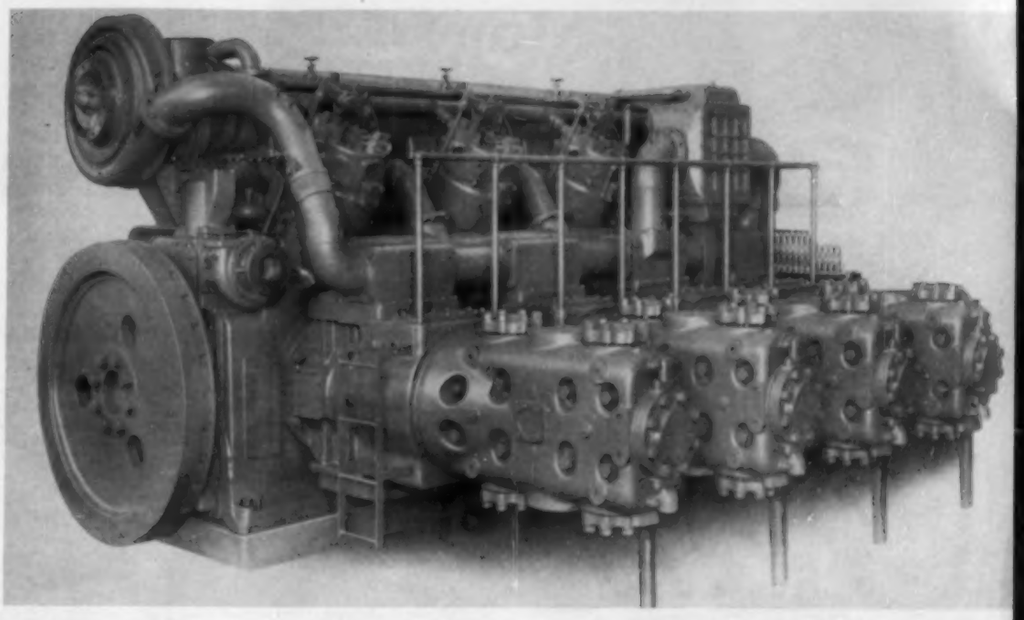
SIMPLIFIED FIELD CONVERSION KITS

THROUGH use of new and unique conversion kits, horsepower ratings of many existing 2-cycle engine driven compressors can now be increased substantially, and for relatively low investment. At the same time fuel economies can be improved considerably. As the direct outcome of a long-range research and development program on engine turbocharging, completely integrated engine auxiliaries have been designed and are now being built for all current V-angle Cooper-Bessemer 2-cycle engines. The successful achievement of an integrated engine auxiliary capable of being mounted directly on older 2-cycle engines was a primary objective of the original design program. Cooper-Bessemer engineers forseeing the present trend to modernization and uprating existing engines to increase station horsepower, concentrated their efforts to perfect a unit that could be applied to *both* new and existing engines.

The recent introduction of complete field conversion kits has in effect provided an exceptionally simple and economical method for uprating engine horsepowers. In addition to higher output, it has produced substantially higher fuel economy from present engine equipment. As a result, savings in station space, foundations, and attendant labor are likewise substantial. Noting the increases in horsepower of 22% to 50% in the chart below, the potentials of attaining additional power with the same station facilities become more and more apparent. Increases in horsepower that can be expected are:

Type of Eng.	Former HP per cyl	New HP per cyl	% Inc.
GMXA	62.5	78	25%
GMXD	66	82.5	25%
GMV	100	135	35%
GMV	100	150	50%
GMV-TV	110	135	23%
GMV-TF	110	150	35%
GMVA	135	165	22%
GMVA	135	180	33%
GNW	250	350	40%
GMWA	250	350	40%

In addition to increased horsepower, these kits provide uprated engines with even greater overload capacity than was previously possible. Prior to this time, all engines had to be derated for altitude. However, these same engines with turbochargers modified for altitude now pull their full seal level ratings at elevations up to 7500 ft. Higher thermal efficiencies realized on engines modernized with these kits should perhaps be noted here. Because of better conversion of heat to usable power, fuel consumptions as low as 6900 btu/hp/hr can be guaranteed. Lower waste heat, of course, means less cooling equipment and in many cases, engines uprated to new horsepower can operate with their higher outputs without additions to existing cooling systems.

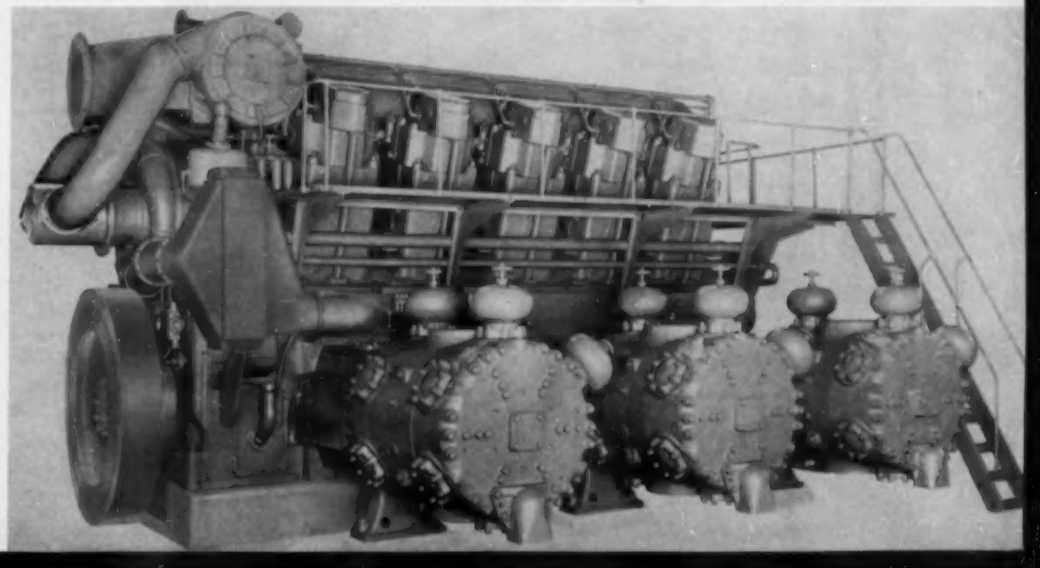


Cooper-Bessemer type GMXF-8 V-angle engine driven compressor equipped with parallel turbocharging system. (Fig. 1)

Two types of field conversion kits have been developed for converting existing Cooper-Bessemer 2-cycle engines. One type kit provides a parallel turbocharging system, the second a series turbocharging system. The parallel type of turbocharging system, developed specifically for Cooper-Bessemer GMXA, GMXD, GMV and GMV-TF engines, is an all-exhaust-driven turbocharger auxiliary that compliments the existing engine reciprocating scavenging pumps (Fig. 1). The series turbocharging kit, designed for the later model engine driven compressor, such as the GMVA and GMWA units, is an all-exhaust-driven turbocharger introduced into the engine air intake system as a first stage of compressions (Fig. 2). With the series turbocharging arrangement, utilizing an engine-driven blower for second stage compression, the engine at its start or at any partial load is not completely dependent on exhaust heat for its supercharging effect. The engine is supercharged from the moment it starts as well as throughout all speeds and loads. Consequently the series turbocharging makes it one of the most efficient systems in use today. High efficiency is maintained even at fractional loads.

It is important to note that with either the parallel or series turbocharger system, the engine is completely self-starting and sustains itself at all loads. The characteristics of the turbocharging system eliminate all need for mechanical disconnect devices or couplings as required on some engines for starting and running at partial loads. The fact that the turbocharger converts exhaust energy formerly wasted into usable power is especially significant to the economy-minded operator. At present, it is estimated that there is over 2½ million horsepower in the field that could profitably utilize the benefits in additional horsepower and fuel economy now possible with conversion kits like those described here. Depending upon the size and type of engine, field conversions can be made in 4 to 7 days with simple assembly or skills.

Series turbocharging system on Cooper-Bessemer type GMWC-10 V-angle engine driven compressor. (Fig. 2)



GAS TURBINE PROGRESS

A COMMENTARY BY R. TOM SAWYER

R. Tom Sawyer's well known in the gas turbine field having been the first chairman (1944) (and now treasurer) of the Gas Turbine Power Division of ASME. He spent 7 years with G.E. Transportation Dept., and 26 years with American Locomotive, now Alco Products. At present he is a Consultant, including "Consultant to the Staff" of the Experimental Towing Tank at Stevens Institute of Technology. In addition to being a Fellow Member of ASME and AIEE, he is a member of SAE, ARS, ANS, IME in London, DEUA in London. He is also a member of Franklin Institute and a Professional Engineer. Mr. Sawyer is the author of *The Modern Gas Turbine* and *Gas Turbine Construction*, and co-author of *Applied Atomic Power*.

Two New English Gas Turbines

English Electric EM-27P Unit

The English Electric EM-27P gas turbine unit was behaving beautifully when I saw it on test at the builders plant in Rugby, England a few months ago. Several of these units are now in service and on order. This turbine unit is very versatile as it can operate well at variable load and speed as well as at constant conditions. For this reason this turbine is either capable of or actually operating on many applications including: Standby plant, peak load plant, central station duty, packaged power plant, compressor and pump drive, gas line pumping, process applications, locomotives, marine propulsion and auxiliaries. In describing this unit it is best to let the photographs and tables speak for themselves. The dimensions of the unit without the heat exchanger (Fig. 1) are practically the same as the unit with the heat exchanger. Note Fig. 2 how the heat exchanger fits into the space above the turbine in a very compact manner.

One particular feature should be stressed and that is vertical combustors are used. We used to hear a lot of argument regarding horizontal and verti-

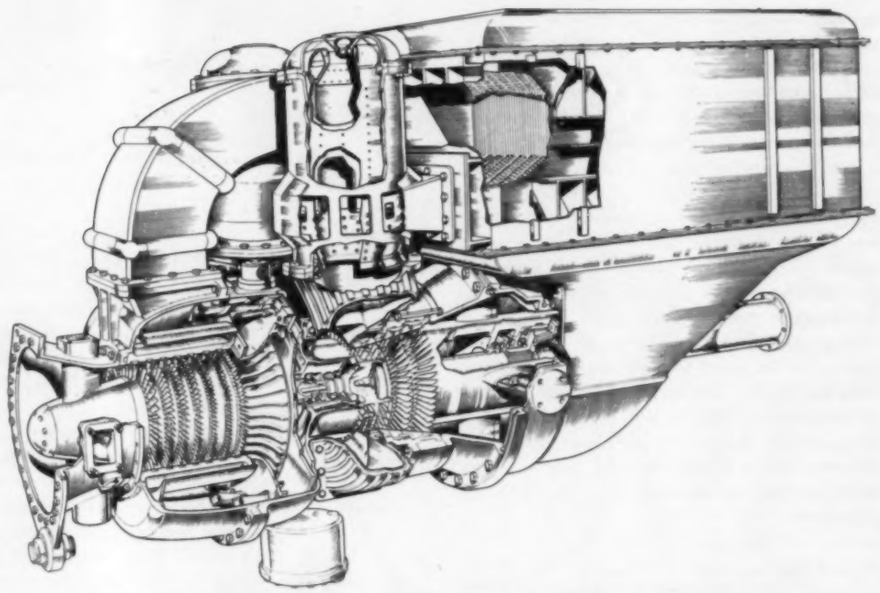
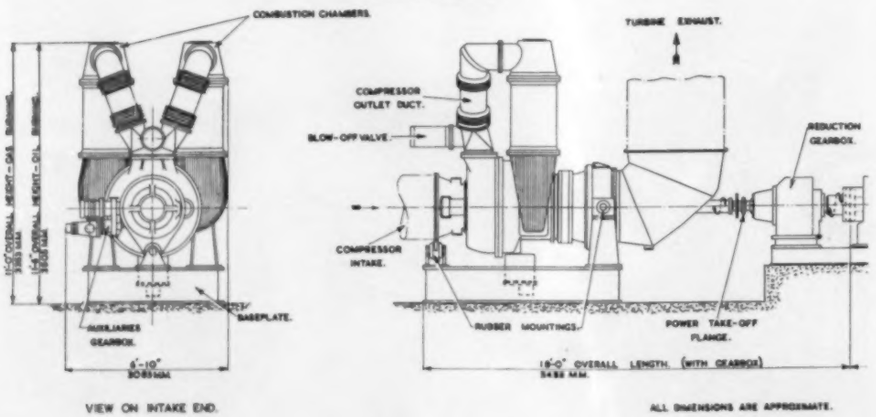


FIG. 2. Phanton view of English Electric EM-27P Gas Turbine complete with heat exchanger. Note the 6 stage axial compressor plus one radial stage; Pressure Ratio 4.8 to 1; The heat exchanger is a special plate type; The combustors of the all metal vertical type. A two stage turbine drives the compressor and exhausts into a second two stage turbine on a separate shaft which develops the external power.

FIG. 1. English Electric EM-27P gas turbine unit without heat exchanger. The dimensions with heat exchanger are overall height 10 ft 6 in., width 7 ft 6 in., length approximately the same.



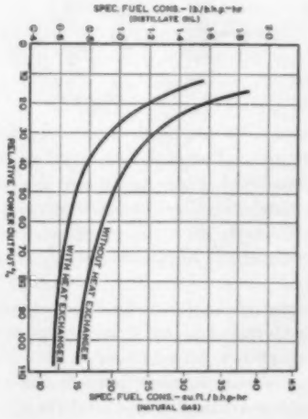

SPEC. FUEL CONS.-lb/b.h.p-hr (DISTILLATE OIL)
RELATIVE POWER OUTPUT %
WITHOUT HEAT EXCHANGER
WITH HEAT EXCHANGER
SPEC. FUEL CONS.-cu ft./b.h.p-hr (NATURAL GAS)

FIG. 3. Specific fuel consumption curves of EM-27P unit.

cal diesel engine cylinders. Today the majority are vertical and the trend for gas turbine combustors is to make them vertical thereby not disregarding the advantages of gravity. Even with the vertical combustors and heat exchanger this unit can be located in a locomotive or as a portable power plant on a special railroad car. The data of Table 1 is based on the power turbine operating at 7,000 rpm and the compressor turbine operating at 8,250 rpm. The turbine inlet temperature is 1430° F. The fuel consumption figures of Fig. 3 are based on the above conditions and an ambient temperature of 60° F with sea level alti tude. The natural gas has a lower calorific value of 895 BTU/cu ft and the distillate oil with a lower calorific value of 18,555 BTU/lb.

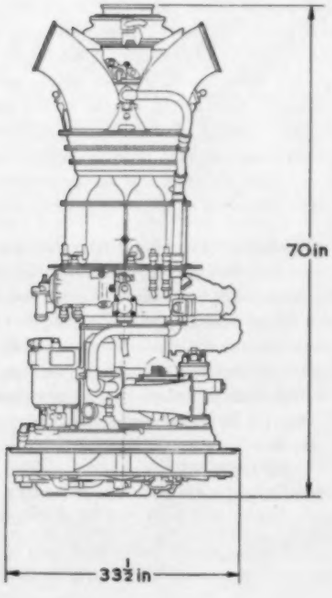
TABLE 1 MAIN DETAILS

Item	With Heat Exchanger	Without Heat Exchanger
Design rating of 60° F and Sea Level Altitude	2,750 bhp	2,957 bhp
Efficiency at design point	23.85%	18.45%
Mass Flow at design point	42.5 lb/sec.	43.0 lb/sec.
Overload Rating	2,960 bhp	3,230 bhp
Weight of Bare Turbine Approximate	30,000 lb	20,000 lb

Napier Gazelle

I also visited the London plant of D. Napier & Son, a division of English Electric, and there I saw an unusually attractive small turbine unit called the Gazelle, N. Ga., (Fig. 4). This was specifically designed for helicopter use, but is very suitable to marine and industrial applications because for helicopter use it must be capable of operating through a 180° angle. This means the free turbine at the top can be geared to a suitable generator unit placed vertically, all of which takes a floor area no more than one sq yd. In marine application the unit can be located close to the horizontal position to drive a propeller shaft at a continuous load. In a rough sea in a small boat it will operate well under all conditions. The N. Ga. 4 has a dry weight of 900 lbs and at sea level with an ambient temperature of 113° F it has a one hour rating of 1290 shp and a continuous rating of 1060 shp. The fuel consumption in lb/shp/hr for one hour is .725 and continuous .772 which is a good fuel consumption for such a high ambient temperature. As the performance of this unit is excellent I am sure we will hear more about it later.

FIG. 4. Napiers Gazelle Unit of 800 shp to 1600 shp for helicopter, marine and industrial use. Same dimensions when installed vertically or horizontally. Free power turbine shown at top for driving the load.



Industrial Ad Manager

John C. Kosky

Baldwin - Lima - Hamilton Corporation, Philadelphia, has appointed John C. Kosky, veteran Air Force officer and sales promotion expert, as manager of industrial advertising. In this post, he will have charge of advertising and all other promotion for the four industrial divisions of B-L-H. The divisions are Eddystone, Eddystone, Pa.; Loewy-Hydropress, New York City; Standard Steel Works, Burnham, Pa., and Hamilton, in Hamilton, Ohio. Kosky will have headquarters in B-L-H offices at 111 Fifth Ave., New York. Prior to joining B-L-H, Kosky was director of public relations and sales promotion for the Wales-Strippit Company, Akron, N. Y.

Engineers Promoted

R. F. Kymer

D. L. Gallogly

The elevation of Dennis L. Gallogly to Assistant Executive Engineer has been announced by Ralph L. Boyer, Vice President and Director of Engineering of The Cooper-Bessemer Corporation, Mount Vernon, Ohio. In his new position as Assistant Executive Engineer, Mr. Gallogly will work under the immediate direction of Mr. Edmund Fredrick, Executive Engineer. In this capacity the three basic engineering divisions of Cooper-Bessemer, namely the Product Division, the Development Division and Technical Division, will report directly to Mr. Gallogly, Mr. Boyer points out. The post of Chief Engineer, Product Division, formerly held by Mr. Gallogly, will now be managed by Mr. R. F. Kymer. Mr. Kymer had previously been Assistant Chief Engineer of the Product Division since early this year.

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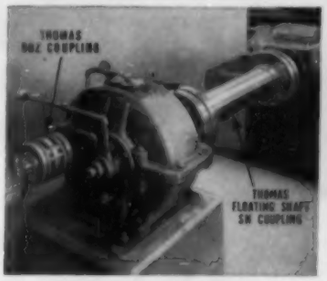

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AUTOMOTIVE DIESEL PROGRESS

A COMMENTARY BY **MERRILL C. HORINE**

Merrill C. Horine, for 38 years a member of the Society of Automotive Engineers, has been actively engaged in automotive engineering, sales promotion and training, advertising and editing of automotive publications since 1907. He has contributed numerous papers on diesel and allied subjects to the SAE and other organizations. An officer in the Air Service in World War I, he was a consultant to the Chief of Ordnance and the Automotive Division of the War Production Board in World War II.

Development of Diesel Details – Part One of Two Part Article

FROM Dr. Diesel's first crude compression-ignition engine, intended to burn pulverized coal, to the highly-developed diesels of today is indeed a far cry, many fundamental improvements having been made. But parallel with the basic improvements in the combustion and injection systems, a host of minor developments have been carried to successful conclusion. Without these refinements of injection, combustion and mechanical design, the diesel would never have attained its present state of efficiency, reliability and economy. Many of these improvements are familiar; but some are of more recent origin and deserve particular notice.

For Better Breathing

For the sake of higher volumetric efficiency, diesel manufacturers are taking advantage of every possibility, such as the painstaking study of valve timing in relation to the speed and load characteristics of the engine, careful development of cam contours to permit the greatest possible duration of opening without shock or bounce of the valve gear and higher valve lift. These matters become increasingly important and difficult to perfect as the rotative speed of the engine increases. Consequently it is logical to expect that the automotive coterie should have gone to the greatest lengths in this direction. Increasing valve lift has presented particularly knotty problems as respects cam design and particularly in its effects upon valve lifter and cam wear. A great advance in this direction is embodied in tungsten-carbide-faced mushroom lifters, which have been so perfected that their durability seems equal to the entire engine life and their permanently smooth surface benefits the cams in like manner. Others have chosen the dual valve as the way to better volumetric efficiency and all designers have directed a great deal of effort on perfecting and streamlining port passengers to offer the minimum of restriction. Some thought is being given to shot-burnishing the insides of intake manifolds to reduce skin friction.

Opposite Manifolding

Another trend in this direction is toward opposite manifolding. There have always been automotive diesels with exhaust and intake manifolds on opposite sides of the engine; but in the majority both manifolds are on the same side—usually on the right. This practice was inherited from the automotive gasoline engine. The reason, of course, was to avoid interference with the steering gear which is normally alongside the engine on the left side. With the generally wider hoods and in some cases widened frames and front wheel treads, it has become practicable to place the exhaust manifold on the right side and the intake on the left. By this means greater freedom is enjoyed by the designer in developing free port connections, water jacketing is simpler and more effective and larger intake ports may be used. Aside from these, separating the two manifolds avoids absorption of exhaust heat by the intake air. Siamesing of ports is rendered unnecessary and manifold gasketing problems are simplified.

Valve Rotation

Today, the desirability of valve rotation is universally accepted. By its very nature, the helical spring used for poppet valves, tends to cause the valves to rotate; but though they turn in one direction as they are lifted, they turn back again when they return to their seats. Where two concentric springs are used they are usually wound at opposite hand, so that even this effect is largely nullified. In any case, unless there is some slip at either end of the spring, they will tend to seat the valve at exactly the same index each time. In some engines and some valves in the same engine will thus turn naturally without any extraneous devices; but such rotation is usually spasmodic where it occurs at all. Offset mushroom lifters often foment valve rotation because they themselves often spin quite freely when the valves have seated and they have clared the tappets; but here again there seems to be no way to control such movement. Accordingly means have been adopted in an increasing number of engines to make sure that the valves do turn. These means are in two classes, namely the free valve device and the positive valve rotator. The former frees the valve from the wind-and-unwind action of the spring and allows the constant turning of the lifter to rotate the valve. The latter, by means of a combination of balls, springs and a ramp, forces the valve to turn a small fixed number of degrees each time it is lifted, so that it makes a complete rotation every 200 or so cycles. At first these devices were thought to be necessary only on exhaust valves, where indeed their use is principally confined; but as mean effective pressures have risen steadily, their use on both sets of valves has begun to appear.

Benefits of Valve Rotation

Valve rotation prevents pitting of both valve faces and seats to a considerable extent. Where there is a tendency for unequal heating about the periphery of the valve port, rotation equalizes the effect on the valve, avoiding localized burning. Slight eccentricity of the valve, which is so apt to result from heat differentials in the head casting and its effect upon alignment of the seat with the stem guide, is also compensated to a considerable degree. Valve guide wear is materially reduced by valve rotation, since it definitely eliminates uneven wear from slight stem warpage. All of these benefits spell longer valve, valve seat and valve guide life and better sealing of compression. Another tendency in the same direction of improving valve sealing and valve life is the use of the so-called flexible valve. Such valves, instead of the conventional slight doming of the valve head, have the head dished out, so that slight misalignment between the valve and seat can be compensated for by a slight deflection of the valve head to conform.

Such valves are most successful in connection with valve rotators. Sodium or sodium-mercury valve cooling, so popular in gasoline engines, has not as yet been found necessary in diesels, largely because their superior thermal efficiency results in so much less heat rejection to the exhaust, so that solid-stem valves remain below critical temperatures. These may yet be found necessary.

EDITOR'S NOTE: The concluding article in January will feature such topics as Protecting Head Gaskets, Angle-split Connecting Rods, Larger Crankpins, Lubricating Injection Mechanism, Avoiding Contamination From Fuel, and information on other important diesel developments.

Manager Sales Engineering

Paul O. Lewis

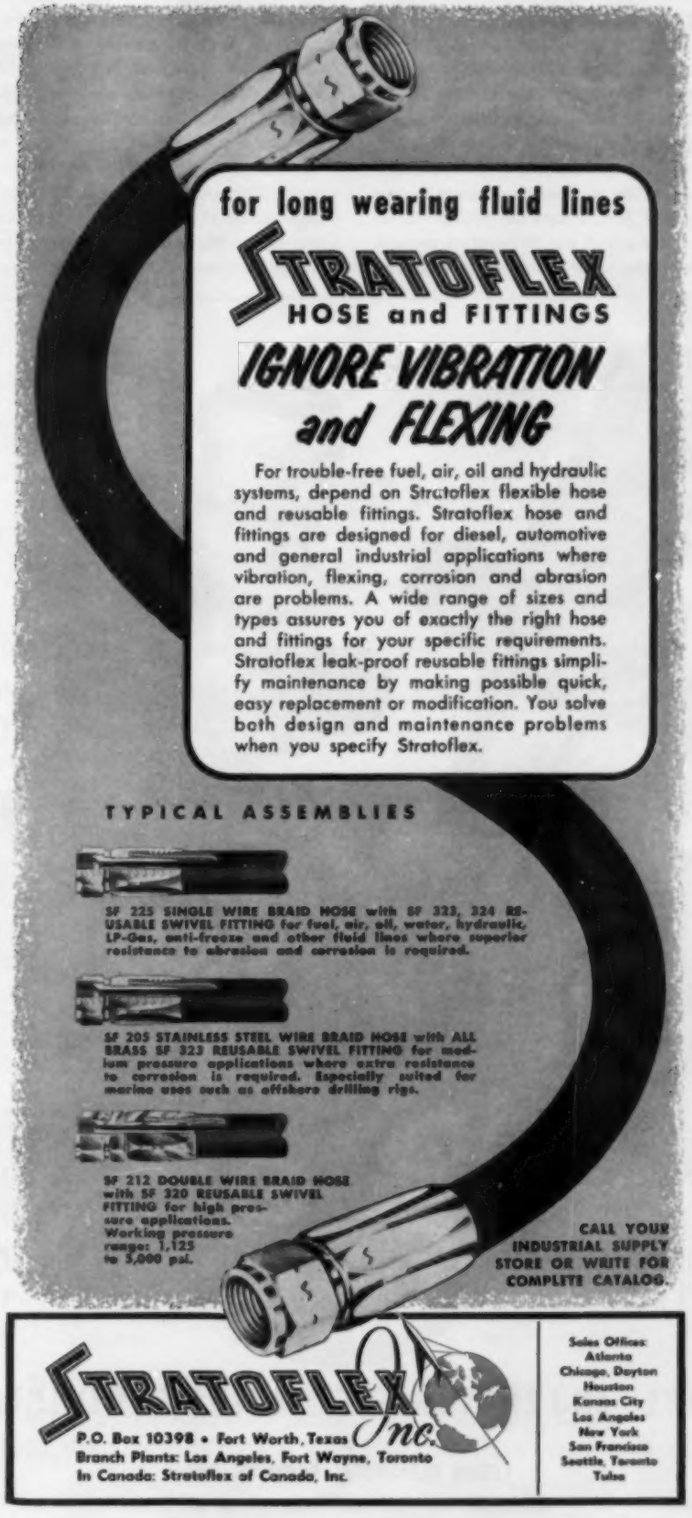
The transfer of Paul O. Lewis from the Engineering Department to the Sales Department with the title of Manager, Sales Engineering at the Cleveland Diesel Engine Division of General Motors, was announced recently by K. O. Keel, General Sales Manager of the Division. Keel said concerning the appointment of Lewis, "So that we may render better service to our customers we feel that the marine design section should be more closely related to the sales department. Mr. Lewis is eminently qualified to head up this activity because for the past several years he supervised tug design at Cleveland Diesel." Paul Lewis was born in Erie, Pa. He attended the School of Engineering at Pennsylvania State University. In 1937 he came to Cleveland Diesel in the electrical department and held various positions until he was named Assistant Chief Electrical Engineer in 1951. On July 1, 1955, he was named Chief Marine Engineer and has held this position until being appointed Manager, Sales Engineering. Mr. Lewis is a member of the American Society of Naval Engineers and the Society of Naval Architects and Marine Engineers. He and his wife, Doris, live at 11741 Edgewater Drive, Lakewood, Ohio.

General Sales Manager

Martin D. Archangeli

Martin D. Archangeli, assistant general manager of the Saginaw Division since January, 1956, has been promoted to the newly created position of general sales manager of Eaton Manufacturing Company, it has been announced by Ralph E. Fisher, Vice President-Sales of the quarter-billion-dollar producer of automotive, aircraft and industrial parts and components. "Mr. Archangeli's appointment is a move toward meeting the increasing demands of the automotive and other industries and the greater decentralization of industry during recent years," Mr. Fisher said. "The new general sales manager has a fine background of successful experience in automotive and aircraft sales and division operations."

He will make his office in Eaton's Detroit headquarters at 9771 French Road. Born in Allegheny, Pa., and educated in Saginaw, Mich., Mr. Archangeli joined Eaton Manufacturing in 1922 in the Saginaw Division's production-planning department. Five years later he was transferred to the sales department and in 1939 he was made sales manager of the Saginaw Division. In 1950 he was appointed general manager of sales for the Saginaw, Valve and Aircraft products. The new Eaton general sales manager is a member of the Society of Automotive Engineers, the Aero Club of Michigan of which he was a director from 1951 to 1954, and the Detroit Athletic Club. Mr. Archangeli is married and resides with his wife and two children in Birmingham, Michigan.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Eastern Diesel Observations

By Arnold B. Newell

The Maritime South

To my way of thinking the Maritime South lacks good press agency work but perhaps it needs none. Without endeavoring to belittle the marine activities of other parts of the country, I do believe that to bring the Gulf Coast into proper perspective is in order. It seems to me that the ones who live along the Gulf of Mexico can not see the forest for the trees and the ones not living there can not see it at all with the noteworthy exception of the ones who total up their sales of engines and other marine equipment. The Pacific Coast and the inland rivers regions have taken good care to inform the rest of the country of their importance marine wise. The building and delivery of a 1600 hp diesel tug in New England is justification of a day of celebration on the harbor. To a lesser extent this is true as one moves south on the Atlantic Coast. On the Gulf equally big or bigger and more powerful diesel boats slip into service unheralded and unsung. Without them the vast off shore oil activities could not exist. Oil refineries are in some cases wholly dependent upon them for supplies of crude. They are as thick as flies all over the bayous, Intracoastal Waterway and the rivers, particularly the lower Mississippi. Everywhere from Corpus Christi to Florida these diesel boats operate in all classes of service including passenger transportation, for personnel boats are passenger boats. Everything that will float and carry an engine is dieselized. Some are old and beaten up on the outside with fairly new diesels driving them. Most are new and modern, designed, powered and built for special services.

In many instances they do not conform to a fixed pattern nor style of design and the only things that all hold in common are the diesel and the screw propeller employed in a vast number of different arrangements, both twin screw and single screw and usually with a reduction gear. Some are designed for the rough water service off shore, some for nothing but inland work and others are a compromise best suited to one class of service and equal to another. In many instances they are not very pretty boats, but as workhorses that can not be beaten. They are usually good places for men to work and live high on the hog. You will find more good competent marine diesel men to the square mile along the Gulf than in any other part of the country. If it were not for the oil industry and other needs of boats in transportation, the shrimp industry would look big for that is what it is. Other fishing activities are important, too. Harbor work is increasingly important for tugs. So far as I can see every engine company is there in force. If any one has missed the boat it's too bad. Some are handicapped with distributorships not in the region of major activity. When that has happened, local dealers are loud in their complaints. Being a Yankee who drinks "northern coffee" I have been well received, but a month on the Coast is not enough time to learn more than that a lot of us don't know what it is all about. Of one thing I am sure—selling in these parts is no easy task, but the one who successfully breaks in strikes it rich.

The Shilshole Bay Basin

Although these remarks are under an Eastern heading, being a former Seattleite I feel it is in order to say something about the Shilshole Basin on which work is about to start. In the early days Elliot Bay on which Seattle faces was looked upon as rivaling New York as a National seaport and boating center. However the trade to Alaska and the Orient and local shipping shortly outgrew the natural harbor. When the canal was built from Ballard to Lake Washington and the facilities were set up for wintering fishing boats at Salmon Bay fleet expansion became possible that could not have taken place without the canal having added Lake Union and Lake Washington to the deep draft shipping waterfront of the city. The added facilities were largely instrumental in creating at Seattle one of the Nation's greatest concentrations of demand for marine diesels. Down over the years Shilshole Bay proved to be a problem because it is a rough spot with Northwesterly winds. Boats leaving the Lake Washington Ship Canal and the existing ship channel had to keep right on going once spewed out on Shilshole Bay and since this could not always be done the canal became a bottle neck. With a basin outside the canal for 1500, more or less, boats big and small, natural growth of the marine industry at Seattle will not be hampered as it has been. From the viewpoint of diesel sales, this area will become far better than ever before.

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Director Of Research

Julius E. Witzky

The appointment of Julius E. Witzky as director of research of The White Motor Company was announced recently by John N. Bauman, President. Mr. Witzky was born and educated in Stuttgart, Germany. He has devoted his entire business career to the development and advancement of engine power plants, both in Germany and the United States, and served for 18 years as chief engineer and head of the Engine Division of Daimler-Benz A. G. of Stuttgart. "Because of his broad background and experience in all types of engines, Mr. Witzky is especially qualified for his new position as director of research, concentrating on power plant developments to meet rapidly changing conditions taking place in this field," Mr. Bauman said.

Mr. Witzky came to this country in 1946 under the Army's "Operation Paperclip" program, which provided for entry of prominent foreign scientists and specialists outside of the U. S. immigration quota. He is now an American citizen. In 1930, at the age of 27, he designed the 1200 hp light-weight diesel engine for the Zeppelin which crossed the Atlantic several times under the command of Professor Hugo Eckener. After World War II Mr. Witzky designed the only 45 hp diesel engine used in passenger cars. This engine today is the power plant for the famous Mercedes-Benz diesel automobile. In 1948, Mr. Witzky joined the Packard Motor Car Company as development engineer, an association which continued until 1956 when he left the Studebaker-Packard Corporation to become chief engineer of Daimler-Benz of North America, Inc. in New York City. The new White Motor research director has several important patents and publications to his credit and has been a member of the Society of Automotive Engineers since 1950.

Big Diesel Starts 2100 Mile Move

One of the biggest moving jobs in recent San Francisco history has been completed with the departure for Waverly, Iowa of the 110-ton Enterprise RV-16 diesel engine, largest engine of its kind ever built in the 18th and Florida Streets plant of the Enterprise Engine & Machinery Co. The single turbocharged 16-cylinder 4,890 hp engine, which weighs 220,000 lbs, will drive a 3,500 kw generator in the municipal electric generating plant of Waverly, first city in the U. S. to receive the newly developed Enterprise power plant. Worth a half million dollars, the new RV-16 stands 12 ft 8 in. high, its length from turbo to turbo is 22 ft 8 in., and its width is 9 ft 4 in. Lashed securely to the truck trailer, the engine which Enterprise officials assert is "the world's most powerful 4 cycle diesel for its size," was trucked for several blocks to a railroad siding, where it started on its 2100 mile journey. The unusual design of the new RV-16 permits 8 pairs of pistons in opposing V-banks to lie directly opposite each other, resulting in a compact engine which has a top rating of 7,700 hp at 400 rpm.

The Waverly installation, coupled with a 3,500 kw Elliott generator, is believed to be one of the largest of its type in the country. Waverly's present generating capacity totals 5,940 kw, at two plants, including 6 diesel and dual fuel engines and 3 small hydroelectric units. The firm dependable capacity, which neglects the hydro and one 1,350 kw dual fuel unit, comes to only 4,095 kw, barely in excess of peak demands of 1955. Studies conducted by Associated Consultants of Minneapolis, revealed an average annual increase in demand for power of about 9 per cent, indicating the need for more power. The new Enterprise engine and its generator will boost Waverly's total power capacity to 9,490 kw and the dependable capacity to 5,445 kw, more than enough for the city's immediate needs and reserves for several years to come. The new Enterprise will operate primarily on natural gas in conjunction with oil fuel. It is equipped with 4 Brown Boveri turbochargers and two Maxim 40-MUS exhaust silencers.

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Florida Diesel News

By Ed Dennis

A TURBO charged Cummins diesel was installed in an International hi-way tractor for Haydens, of South Miami, a fruit and produce company. Installation included a model JT6B Cummins rated 175 hp, Bendix-Westinghouse air compressor and Fuller RoadRanger transmission.

A NEW 73 ft trawler was launched up at the Morehead City Shipbuilding Corp. yard and christened the *Admirals Pride*. Propulsion is provided by a General Motors 6-110 diesel developing 210 hp at 1800 rpm. The r&r gears are 4.5:1 from Allison and the 3 in. shaft drives a 52 x 38 four bladed Federal propeller.

SHELLEY Tractor & Equipment Co. engineered and installed a D326 series F Caterpillar diesel generating set rated 100 kw at 1800 rpm 120-208 volt, at the First National Bank of Ft. Lauderdale. Installation also included a Trojan rectifier and Southway batteries for the electric starter.

A TD 18 International diesel crawler tractor with a hydraulic bullgrader was delivered to Industrial Constructors of Ft. Lauderdale from Florida Georgia Tractor Co. A similar model tractor was recently put into operation at Minton's trash dump near Opa Locka.

TWO Waukesha diesel generating sets were sold for the Marine Laboratory and Aquarium on the island of Bimini, B. W. I. each model 195 DLC engine has a hp rating of 76 at 1800 rpm, the Electric Machinery generators develop 35 kw; American Bosch fuel oil systems are used.

C. T. STOCKTON, road contractors, took delivery of one of the largest motor graders manufactured; (45,000 lbs) a T700 Galion powered with a HRFB 600 Cummins diesel which develops 180 hp at 2000 rpm. It was supplied by Florida Georgia Tractor Co. This piece of dieselized road equipment is expected to play an important part in So. Florida's new road program.

DIESEL Engine Sales of St. Augustine delivered 3 more 67 ft trawlers to the expanding Lyco fleet. They are powered by D342 Caterpillar diesels with Twin Disc power take-off, 3:1 Snow Nabstedt r&r gears and have 3 kw Onan diesel generating sets.

CUMMINS Diesel Engines of Florida Inc. repowered a model 175-A Michigan scoop shovel with a model JBS 600 engine rated 150 hp at 2500 rpm, for Ideal Crush Stone Co. of West Medley and Florida Rock Products of Brooksville had another Cummins installed on one of their Euclid tractors.

AT THE Village of North Palm Beach, J. B. Fraser and Sons, dredging contractors, are pumping sand for a housing development with their new 80 ft dieselized dredge. Shelley Tractor & Equipment Co. supplied the D397 series D Caterpillar turbocharged diesel which is rated 650 hp at 1300 rpm. Also included is a 10 in. Georgia Iron Works pump Cotter GR2000E, 2:1 r&r gears with clutch and a Falk coupling plus a Maxim exhaust silencer.

AN Allis-Chalmers diesel 15 kw generating set, 1800 rpm 3 phase 120/208 volt, was installed in a truck to supply power for portable floor sanding equipment for the Rowell Flooring Co. by Peninsular Armature Works.

AT FORT Lauderdale, Ellis Diesel Sales & Service repowered the 53 ft yacht *Osprey* with 2 General Motors turbocharged lightweight diesels, shp 300 at 2300 rpm. The yacht is owned by the Collins Radio Co., Dallas, Texas.

AT Dinner Key, Mr. Sheppard had a

Where performance is the measure

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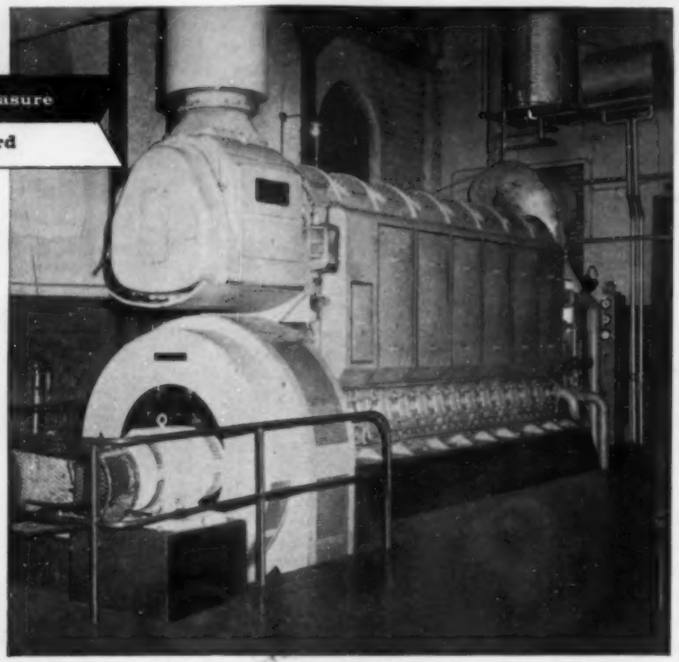


Generating power for the city of Thief River Falls, Minn., is one of the most recent installations of the modern Opposed-Piston Diesel... continuing the F-M tradition of reliability.

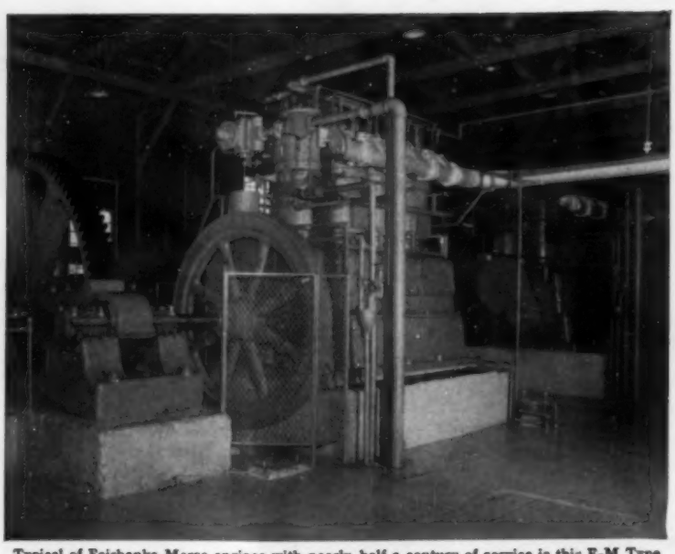
Throughout this country and in every corner of the world, you'll find Fairbanks-Morse diesel engines adding daily to an outstanding record of reliability... a record that goes back more than half a century.

Many of those "old" engines with "young" heavy-duty performance, stand side by side with the newest in modern diesel power—the F-M Opposed-Piston Diesel engine.

Reliability... is a long time

The O-P design of engine today offers unequaled features for heavy-duty power service: 40% fewer moving, *wearing* parts; more power in less space; less weight per horsepower, lower operating and maintenance costs.

6,000,000 installed horsepower of Opposed-Piston Diesels is now continuing the Fairbanks-Morse tradition of dependable, economical power generation. Time spent now in investigating the advantages offered you by the O-P will pay important dividends in the future, so write today for details to: Fairbanks, Morse & Co., Dept. DP-12, Chicago 5, Illinois.



Typical of Fairbanks-Morse engines with nearly half a century of service is this F-M Type RE gas engine driving an F-M pump in water service for the city of Taft, California.

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a name worth remembering when you want the BEST

DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES • RAIL CARS • ELECTRICAL MACHINERY • PUMPS • SCALES • HOME WATER SERVICE EQUIPMENT • MAGNETOS

model OM 6 36 Mercedes-Benz diesel installed by Miami Distributors, in his 40 ft sailboat. The diesel is rated 37 hp and has 2:1 Paragon r&r gears.

BYRD Commercial Diving Co. is building a special steel 100 x 20 ft vessel for salvage work. It will be powered with two GM 6-71 diesels each 175 hp and 2:1 Twin Disc r&r gears.

FLORIDA Georgia Tractor Co. delivered to Finly P. Smith Co. of Davie, two T55 International 15 yd Payscrapers for earth moving jobs on road construction work. These are powered with 165 hp Cummins diesel engines model HRB-600.

A PETTER diesel generating set rated 1.5 kw was included in the engine room equipment on the 67 ft *Michael Edward* launched for Singelton Shrimp Co., Tampa, by Diesel Engine Sales, St. Augustine. Main propulsion is a 165 hp General Motors 6-71 diesel with 4.5:1 Snow Nabstedt r&r gears.

JACKSONVILLE BRIEFS:—Marine Industrial Equipment Corp., Jacksonville, has been named a distributor for Murphy Diesel Engines . . . Gibbs Corp. supplied the D342 Cats for the trawlers *Pinto* and *Live Wire* . . . 2 Enterprise diesel generating sets were installed on the *Angelita*, one of the world's largest sailing yachts.

GENERAL Motors 6-110 tandem diesels developing 440 con hp at 1800 rpm were installed in the 82 ft *Terry Ann* especially designed for trawling off the So. Atlantic coast, for J. M. Jackson. Other equipment included 4:1 Falk reduction gears, 52 x 40 five blade Columbian propeller and a Lister-Blackstone diesel generating set.

A VERY Merry Christmas and a Prosperous New Year to all in the Florida Diesel Engine Industry who make this column possible each month.

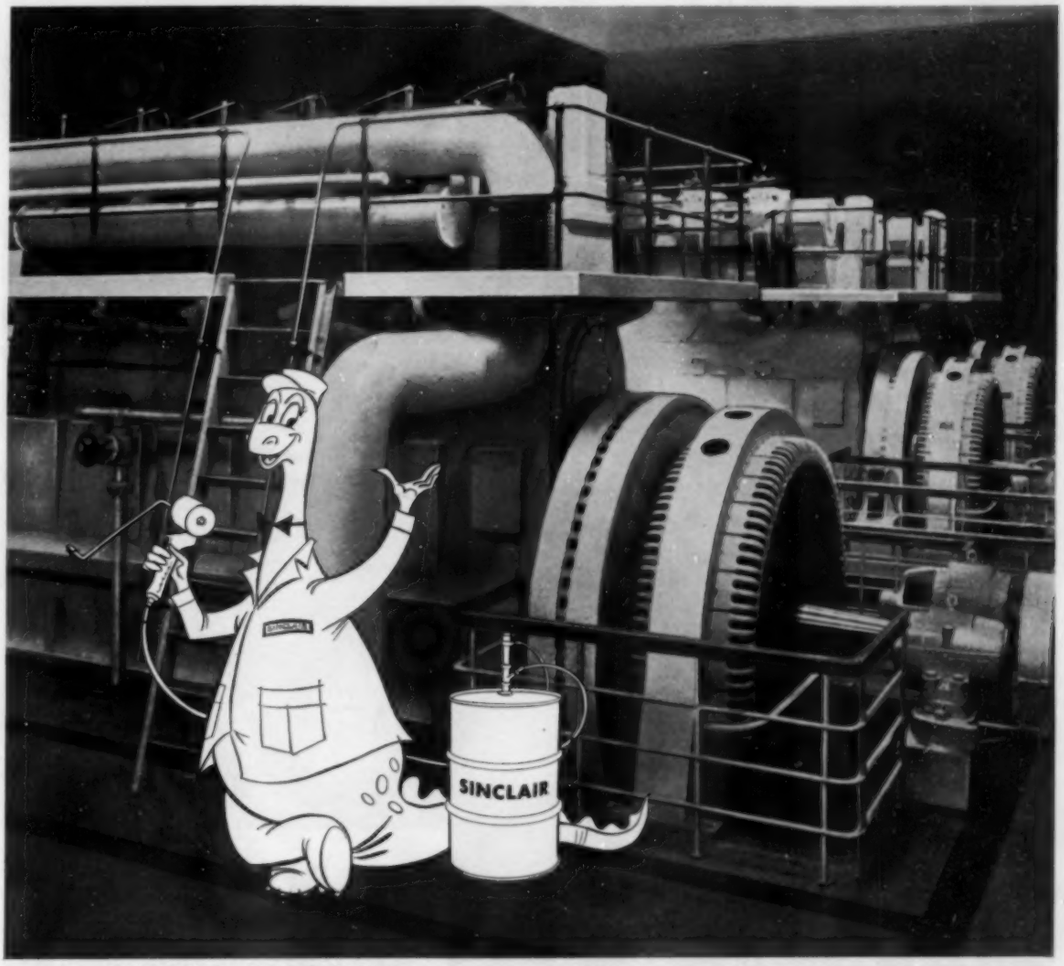
HD-21 Turbocharged

The Garrett Corporation's AiResearch Industrial Division's C-60D turbocharger is now standard equipment on Allis-Chalmers' HD-21 crawler tractor, it was announced by the AiResearch division. The C-60D is one of a family of AiResearch turbochargers now being supplied to diesel manufacturers all over the world. Allis-Chalmers is one of the large manufacturers of diesel construction equipment. The engine of the new powerful HD-21 crawler tractor develops 225 hp at the flywheel. The AiResearch C-60D delivers 60 lbs of air per minute at the top of its best operating range through to the engine. The tractor itself weighs 45,500 lbs. (ITS NEW)

Generator Set Brochure

Katolight Corporation; Mankato, Minnesota now has an attractive brochure available for the asking designed to familiarize persons principally with the merits of emergency electric power plants. The brochure also indicates standard models available and any additional controls and panel equipment that may be desired; also helpful hints in selecting a standby unit for a home, farm, amusement, government and commercial use and particularly the hospital and institutional fields where a power shortage could create discomforts or even disastrous situations. The brochure also mentions other electrical generating equipment to 500 kva that Katolight has been manufacturing. (ITS NEW)

NOW AVAILABLE! The Brand New **DIESEL ENGINE CATALOG,** Volume 22. This giant, 400 page, 10½" x 13½", fully illustrated reference book containing complete and detailed engine and accessory sections is the biggest and best yet. Mail orders are now being filled for this "Bible of the Industry," which has been revised, rewritten and brought up to date completely from cover to cover. Send your order in now for this limited edition, which costs $10 postpaid plus California sales tax where applicable. Send checks or company orders to **DIESEL PROGRESS,** 816 N. La Cienega Blvd., Los Angeles 46, Cal.



Maintenance tips from Dino, the Sinclair Dinosaur

NOW- less oil consumption

Sinclair RUBILENE® Oil has a great reputation in industrial Diesel applications – and for several good reasons. Engineers have found that Sinclair RUBILENE can cut oil consumption, reduce service time to a minimum. It prevents the formation of harmful carbon, sludge and varnish. It stands up under the highest operating temperatures, provides better lubrication protection to cylinders, pistons, rings and other vital moving parts.

Switch to Sinclair RUBILENE and lower your costs. Whatever the make or age of your Diesel, whatever your lubrication problem, there's a RUBILENE or RUBILENE HD Oil that should meet your requirements. Call your Sinclair Representative for further information or write for free literature to Sinclair Refining Company, Technical Service Division, 600 Fifth Avenue, New York 20, N. Y. There's no obligation.

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Mid-West Diesel News

By L. H. Houck

WHITNEY Well Drilling Co., Nisswa, Minn., has purchased a 1-cyl Deutz air-cooled diesel, Model A1L612 to repower a 21-W Bucyrus-Erie Churn drill. This drill is used extensively in northern Minnesota for drilling wells up to 8-in. in diameter and 250 ft deep or more. Crossfield and Nicholson Co., St. Paul, made sale and installation.

NEW Seaman-Gunnison Utility scraper, is a 6 cu yd scraper designed for fast digging and fast transportation over the highway. It is powered with two diesel options—International 650 diesel tractor, modified as an 88 hp prime mover or at lower cost, International 65 hp W450 diesel prime mover. The outfit is self-loading with hydraulic control for steering and scraper controls.

CASE tractororama celebration was combined with open house event for new quarters occupied by Pit & Quarry Equipment Co., in Indianapolis. The company also represents Manitowoc, Bay City, LeRoi and others using heavy duty diesel engines.

LAMBERT Bros., Inc., Knoxville, Tenn., have been hauling large welded engine frames with Mack B-61 Thermodyne diesel tractor and flatbed semi-trailer.

BISON Construction Co. has one of the largest landscaping jobs in the country—doing the streets, roads and utilities at the 5000-acre Grand Forks Airbase job at Grand Forks, N. D. Quantities exceed 3 million cu yd, mostly dirt. Bison assigned 6 LeTourneau-Westinghouse C Tournapulls with 18 cu yd Fullpak scrapers to the job and they are doing about 9000 cu yds a day. Engines are Cummins diesels.

TWIN Coach Co., has received a $350,000 engine order from District of Columbia Transit System, Washington, to replace gasoline power plants. The order is for 100 Fageol-Leyland diesel bus engines.

SOUTH Suburban Safe-way Lines, Harvey, Ill., has placed three new 47-passenger GM diesel busses in operation.

PAYNE Produce Co., Springdale, Ark., has added two new Mack diesels to its fleet this year, making a total of four.

INSLEY Mfg. Co., Indianapolis, has announced a new crane designed specifically for stationary pedestal mounting. It has a rated capacity of 35 tons at 15-ft radius. It has a 60- ft boom and a host of new features. While electric and gasoline power is optional, standard power equipment is GM 4-71 diesel.

WILLIS Shaw Produce Co., Elm Springs, Ark., now have a 16-unit Mack diesel fleet, having added four B-61 thermodynes recently.

ILLINOIS Toll Road under construction by 17 different contractors, boasts use of 42 Euclid Twin scrapers, and 16 TC-12 Euclid Twin crawlers. Power in these units is GMC diesel.

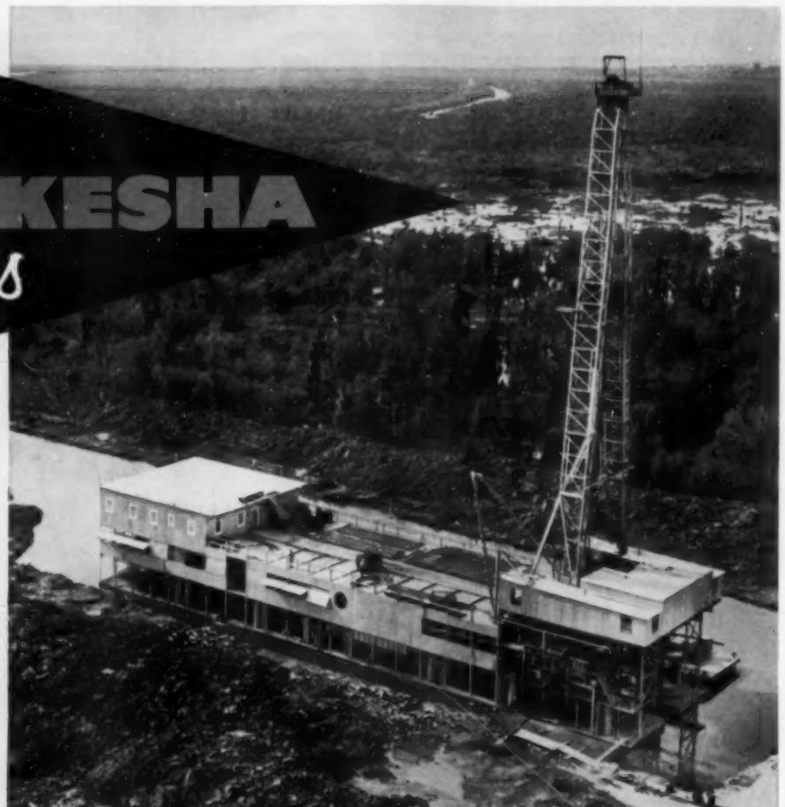
INTERESTING new dirt mover is LeTourneau-Westinghouse Twin C tractor, a 420 hp push tractor on rubber, using two 210 hp GM diesels synchronized through Allison torque converters. It is equipped with two power transfer differentials—one for each pair of wheels and power is transferred from slipping wheel to wheel with more traction. Miller Machinery, Inc., Indianapolis, is one of the Middle West dealers.

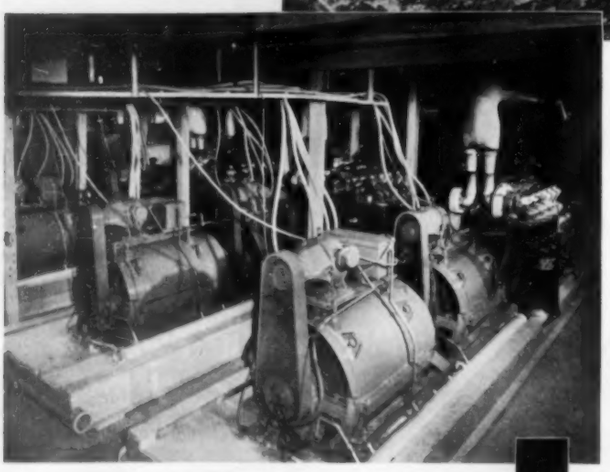
OGDEN Corp., has purchased Eimco Corp., and American Foundry & Machine Co., both of Salt Lake City. Eimco manufactures diesel loading and exca-

five WAUKESHA Diesels

on RIG 6 of the CIRCLE DRILLING COMPANY

SUPPLY ALL POWER





• Circle Drilling Company's 143-ft. Rig No. 6—mounted on their 52 x 220 ft. barge *Kirk C. Lewis* which operates in water to 18 ft. in depth—is one of the world's largest Diesel-electric outfits. Shown here at Week's Island, La., it is drilling a 17,000 ft. well for a major oil company.

Three Waukesha V-12 Diesels—each driving two 540 KW, DC generators—supply power for the Ideco E-2500 drawworks, and rotary; and two Emsco D-1000 slush pumps. These three Waukesha V-12 Diesels are Model VLRDBSU—12-cyl., 8½ x 8½-in., 5788 cu. in., counterbalanced crankshaft—have exhaust driven dual turbochargers for extra power.

Two additional Waukesha Diesels—driving two 200 KW, AC generators—supply power for rig lighting and other auxiliary needs. The mud-mixing pump is an Emsco D-300. These two Waukesha Diesels are Model NKDBSU, 6-cyl., 7 x 8¼-in., 1905 cu. in., turbo-supercharged engines with counterbalanced crankshafts.

Send for Bulletins 1663 and 1634

WAUKESHA Engines and Power Units: 10 hp to 1235 hp—Turbocharged and Normal Diesels • Natural Gas • LP Gas

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vating equipment, used all over the world.

JEFFERSON City, Mo., branch of John Fabick Tractor Co., St. Louis, has added a 40 x 100 ft addition to its large service shop. New facilities contain 4 service bays, two of which are drive-through. Fabick is dealer for Caterpillar, Lorain, Pioneer, Joy and several other lines.

YATES Oil Co., Rogers, Ark., recently bought a Mack B-61 diesel from Springdale dealers, Skelton Motor Co., who report sales of 26 Mack diesels for the first half of the year.

BALLENTINE Produce Co., at Alma, Ark., have also added a new Mack diesel unit to their fleet.

O. B. AVERY & Co., Inc., St. Louis, has been appointed distributor in southern Illinois and southeastern Mo., for Link-Belt Speeder Corp., Cedar Rapids, Iowa, and will provide service and sales for the full line of shovels and cranes.

MIDWEST Industrial & Marine Co., Indianapolis, is a newly appointed distributor for International diesels and power units.

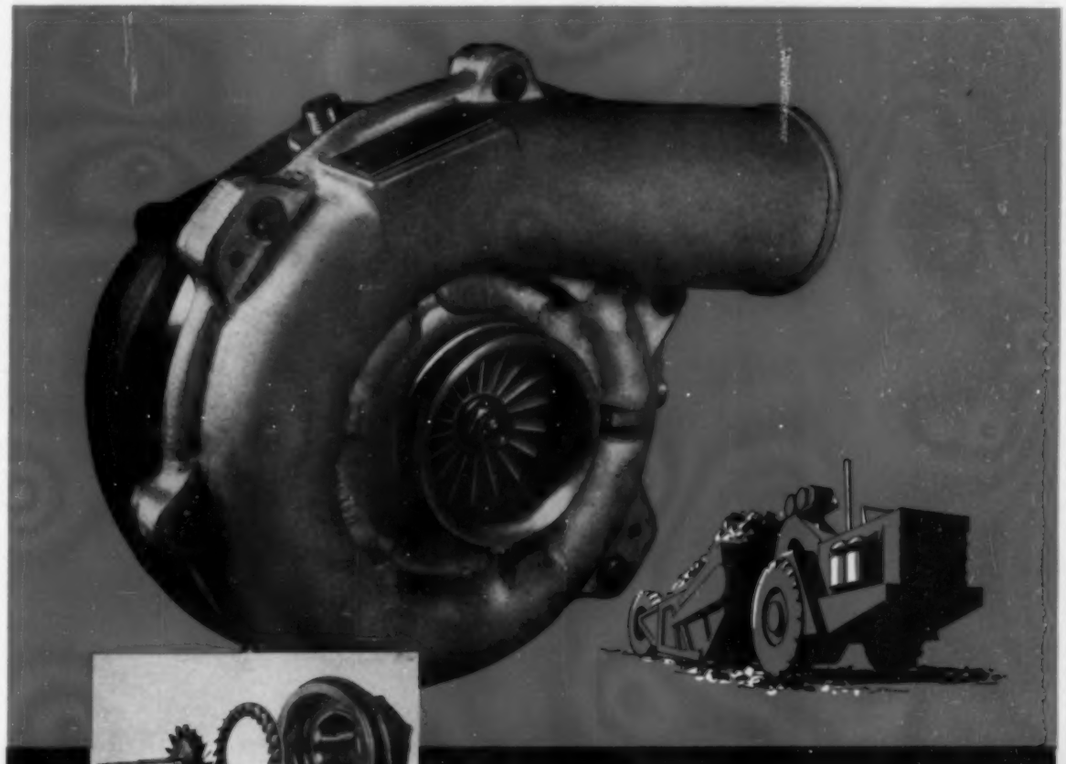
OLIVER Dealers are displaying the new Oliver OC-15 model diesel-powered crawler tractor. It uses the Oliver high-torque 6-cylinder diesel with 529 cu in. displacement, delivering 75 hp drawbar power. Controlled differential steering provides full power on both tracks at all times.

WALKER Mathis Produce Co., Springdale, Ark., have taken delivery on a new Mack B-61 tractor from Skelton Bros., local dealers.

New Tender-Type Drilling Platform

Another development in the field of offshore oil drilling was announced recently by R. G. LeTourneau, Inc. This time it was in the form of a miniature mobile platform designed specifically for use with a platform tender. Buyer of the new-type unit is Arabian American Oil Company of New York. When completed, it will be towed across the Atlantic to work in the Persian Gulf off Saudi Arabia. R. L. LeTourneau, vice president of the LeTourneau firm, said the agile job-hopper sold for less than $750,000—relatively small change in an industry where even permanent-type platforms often cost over $1,000,000. Also he said that, due to simplified construction, the unit is scheduled for five-month delivery. Mr. LeTourneau emphasized, however, that the diminutive size and bargain-basement price are due to the fact this unit will be used only with a platform tender.

Chief difference in operation of the new junior platform and the self-contained units is that virtually all supplies and crew accommodations will be contained on a tender. Like LeTourneau's larger self-contained units now working in the Gulf of Mexico, the Persian Gulf unit will be triangular in shape with only three lattice-work legs. Also like the others, it will be raised and lowered by powerful electric motors geared directly to steel cogs running the length of each leg. Electric power for operating the legs will be supplied by diesel generator sets located aboard the platform. Power for the drilling equipment, however, will be supplied by generator sets aboard the tender. LeTourneau is to build only the platform, and not the tender. Approximate dimensions and capacities for the Aramco unit are as follows: Length overall, 92 ft; width overall 88 ft; depth of hull 10 ft; length of spuds 103 ft; diameter of spud tanks, 18 ft and 4 in.; height of spud tanks, 10 ft; total load during elevation, 112½ tons; and maximum load in fixed position, 350 tons.



NEW! Rugged Turbine Design

Means Less Maintenance with Thompson Turbochargers

Turbine parts on new Thompson Turbochargers are crack- and corrosion-free, thanks to use of a heat-resistant alloy and close attention to design! Built to withstand turbine inlet temperatures of over 1500 degrees, the Thompson turbine is designed to deliver a minimum of 10,000 hours of trouble-free service. Studs have been eliminated from this high temperature section for easier installation and longer life.

You'll find other advanced features in the bearing and compressor sections of new Thompson Turbochargers. Careful location of simple, one-piece bearing has resulted in high critical speeds at smaller shaft diameters. Straight rotor vanes simplify compressor design, maintain highest efficiencies at lower rotor speeds.

Let our engineers show you how you can economically increase the horsepower of your diesel engines up to 100%. New Thompson Turbochargers are available in sizes to efficiently blow diesels from 50 to 300 horsepower.

Write on your company letterhead for Booklet DPE-1257, containing detailed information on Thompson Turbochargers.

JET DIVISION

Thompson Products, Inc.

Cleveland 17, Ohio

Michigan-Ohio News

By Jim Brown

HEAVY Equipment dealers in Michigan were jubilant to hear of the newly announced road program. The Michigan State Highway Commission has announced a $1¼ billion 5-year highway construction plan. This will include construction of over 900 miles of new expressways connecting all major cities of over 50,000 in population, the new construction or reconstruction of 2,900 miles of roads and the paving of all the remaining 800 miles of gravel roads on state trunklines.

A REPLACEMENT engine for a Bay City model 45 shovel—a General Motors Detroit Diesel model 4-71—was recently sold to W. Ignash of Kinde, Michigan. The sale was made by Peninsular Diesel Incorporated of Detroit, Michigan.

THE Chrysler Engineering Department of the Chelsea proving grounds in Chelsea, Michigan has two new International TD-18 cable bulldozers equipped with Allied cabs for year-around grading work. The IH tractors were purchased from Wolverine Tractor and Equipment Co. of Detroit and Grand Rapids.

THE R. G. Moeller Co. of Detroit has delivered a Trojan model 104 loader powered by a Hercules diesel to the Great Lakes Steel Corporation.

CUMMINS Diesel Michigan Inc. has installed a model NH-6-B Cummins in an LJ Mack tractor for Alpena Wholesale Grocery Co. of Alpena, Michigan.

THE Mroczek Bros. of Decatur, Michigan have accepted delivery on an Allis-Chalmers model HD-11B bulldozer, from the Earle Equipment Co. of Detroit.

A MICHIGAN model 125A tractor shovel equipped with a 105 hp GM 3-71 Detroit diesel has recently been delivered to A. H. Proksch Construction Co. of Iron River, Michigan by Lake Shore, Inc., also located in Iron River.

SCHNEIDER Brothers Lumber Company of Sparta, Mich. have accepted delivery on an International model TD-9 crawler tractor. The sale was made by Wolverine Tractor and Equipment Company of Detroit and Grand Rapids.

AN ADAMS model 660 Motor Grader has been delivered to Louis Garavaglia, Inc. of Centerline, Michigan. The grader is equipped with a Cummins HRFBI-600 diesel and is now working on a state highway project near Erie, Michigan. Sale was made by Telford Equipment Co., Inc. of Detroit, Mich.

FOR tipple operation the J. D. McClung Coal Co. of Leivasy, W. Va. has purchased from Ray C. Call, Inc. of Steubenville, Ohio a model 6043-C GM Detroit Diesel 60 kw generator set.

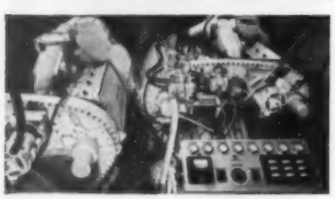
CHIE Brothers of Ypsilanti, Michigan are breaking in a new bulldozer. They've picked an International model TD-9 from Wolverine Tractor and Equipment Co. of Detroit.

A new 335 hp Cummins model NRTO-6-I diesel is being used on a barge with an 8 in. gravel pump by Clare Donaldson & Son of Plymouth, Michigan. Sale was made by Cummins Diesel Michigan Inc. of Detroit.

H. L. WORKMAN, Inc. of Jackson, Michigan are busy breaking in a new Allis Chalmers model 45 grader recently purchased from Earle Equipment Co. of Detroit.

CUMMINS Diesel Michigan Inc. has recently sold a model NH-6-BI Cummins diesel to the W. H. Anderson Co. of Detroit. The new diesel will be used to power a model 20 FDT Euclid wagon.

NAPIER PACKS CRACK LINER SPEEDS INTO 70 FT. CREW BOATS!



3 visible reasons why Napiers were chosen

1 INCREASED PAYLOAD. The most powerful engine for its size and weight in the world, the Deltic takes up less space than engines of comparable horse power. In this case room was made for seating 50 passengers.

2 EASE OF MAINTENANCE. The Deltic is a self-contained packaged unit and all filters are built in. Parts are easily interchanged and can be replaced simply by removing nuts. Pumps can be replaced without timing pumps to engine.

3 ALL WEATHER PERFORMANCE. In rough weather Shell Boats get the best of both worlds. Unlike helicopters, they can still operate and still maintain their relative speed advantage over existing surface transportation.

Employees of the Compañía Shell de Venezuela are now transported to offshore drilling platforms in Napier Deltic powered crew boats that move *faster than crack Atlantic liners*. This is a big advance on existing slow surface transportation or helicopters with small payload and high operating and maintenance cost.

Power for the boats comes from two 9-cylinder opposed piston diesels. These Deltics with their "triangle" of cylinders ensure an amazing balance and freedom from vibration even with 1,620 h.p. in the engine room.

Fast, reliable, all-weather movement of men and materials has become a must for all offshore oil operations if they are to run on an economic round-the-clock basis. Napier Deltics provide twin-engined reliability and drive the fully-loaded, 50-passenger Shell Boats at an easy and safe 35 m.p.h. under continuous cruise conditions.

Plans of Napier Deltic powered crew boats specially designed for Gulf operation are available. For more information on the Deltic diesel contact the Napier Representative—L. O. Brooks, 909 Dupont Circle Building, Washington 6, D.C. Phone North 7-0146.

NAPIER DELTIC MARINE DIESEL

A new conception of Marine Power

D. NAPIER AND SON LIMITED • LONDON • W3 • ENGLAND • Partners in Progress with The ENGLISH ELECTRIC Company Ltd.
CRC D26

THE Austin Company are using a new Ingersoll-Rand model DR-600 air compressor driven by a GM 6-71 Detroit diesel in expanding the Ford plant in Mt. Clemens, Michigan. The compressor was recently purchased from R. G. Moeller Co. of Detroit.

SANITARY Dump Inc. of Kalamazoo, Michigan are working with a new International TD-14 Drott Skid Shovel, equipped with a model K3 blade. Sale was made by Wolverine Tractor and Equipment Co. of Detroit and Grand Rapids.

A NEW Koehring 205 backhoe powered by a GM 2-71 Detroit diesel is digging basements in Livonia, Michigan for Fred Garms of New Baltimore, Mich. The Koehring was purchased from Earle Equipment Co. of Detroit.

WOLVERINE Tractor and Equipment Company of Detroit and Grand Rapids has recently delivered an Internatio.. l model TD-9 Drott Skid Shovel to the City of Midland, Mich.

FOR repowering an Autocar truck, a model HR-6-B 165 hp Cummins diesel is being installed by Cummins Diesel Michigan Inc. for the Michigan Milk Producers Assn. of Imlay City, Michigan.

TELFORD Equipment Co. Inc. of Detroit has delivered two model C Tournapulls powered by GM Detroit Diesel engines to Mahogany Equipment Co. of Ann Arbor, Michigan. The new Tournapulls will be broken in near Colon, Mich. on a Railroad grade construction project.

Tool Catalog

The publication of a new 8-page Tool Catalog is announced by The Weatherhead Company, Fort Wayne Division, Fort Wayne, Indiana. Identified as Catalog 6111, it features the new line of tube working tools which Weatherhead has added to its line of brass and steel tube fittings, hydraulic hose, hose ends and assemblies. The catalog illustrates and describes tools for flaring, burnishing, double flaring, cutting, bending and joining copper and J.I.C. steel tubing. Complete instructions and specifications are included for each. Of special interest is the new Rotary-Type Flaring Tool. This one piece flaring tool features new patented rotary-type clamping dies for dial-matic tube size selection and an automatic tube height gauge which permits positive flare diameter control. This tool is also available with a clutch-operated burnishing attachment and specially designed burnishing cone. Copies of Catalog 6111 are available from The Weatherhead Company, Customer Service Department, 128 West Washington Blvd., Fort Wayne, Indiana. (ITS NEW)

Orders Big Diesel

Nordberg Manufacturing Company announces the receipt of a contract from the City of Marquette, Michigan for a seven cylinder, two-cycle diesel engine. This will be the third 21½ in. bore Nordberg engine to be installed in this municipal plant during the year 1957. Two 10 cylinder engines, each rated 5140 hp, 3640 kw, were installed earlier in the year. The newest engine is rated 3830 hp at 257 rpm and will drive a 2700 net kw General Electric generator. Five Nordberg 21½ in. bore engines, totalling 19,910 hp will have been installed since 1947.

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Inland River Reports

By **A. D. Burroughs**

THE well-known Harry M. Mack will pilot the Ohio Valley Improvement Association through the coming year, one of the many interesting results of the OVIA's 62nd annual convention in early October at Cincinnati.

THE Allegheny River Improvement Association at Oil City, Pa.; The Propeller Club of the United States at Houston; The Inland Empire Waterways Association at Longview, Wash.; The Canal Society of New York State at Utica; The Upper Mississippi Waterway Association at Minneapolis and the Association of Diesel Specialists at New Orleans were some of the late fall meetings bringing river folks together.

WHILE it seemed that everyone was at the meetin', a look at inland river traffic records and the shipyard reports indicate someone was home taking care of the store.

FROM St. Louis Shipbuilding and Steel came the *Hamilton* with christening ceremonies to honor one of the most powerful towboats yet constructed for Illinois River service. Built for Suffolk Marine Corp., chartered to Canal Barge Lines, the 2560 hp from the two Enterprise engines Model DMG-38 will push inland river's first integrated tow from Texas to the Chicago area. The vessel has the standard retractable pilot house, and many names we know, Quincy, Weinman, Carver, and GM auxiliary power.

DOWNRIVER at Louisiana, the E. W. and A. P. Dupont, Inc., launched the 2800 hp tug, the new *Letha C. Edwards*. The 100 by 30 ft tug delivered to the Houston firm, Edwards Transportation Company gets full power performance from a pair of White's Superior Engines to move oil tows on the Mississippi.

NEW Orleans shipbuilders, American Marine Corps., delivered the 2400 hp *Ocean Tide* to owners, Tidewater Ventures Inc. The offshore service craft reports excellent performance from the four tandem drive G-M 6-110 diesels.

AT THE Pascagoula, Miss., yards of the Arnold V. Walker Shipyard, the newest Coyle Lines fleet addition is under current construction. The 80 ft twin-screw towboat will do Coyle service on the Alabama and Mississippi Rivers.

ALSO under construction at these Pascagoula yards, (which is now a subsidiary of Ingalls Shipbuilding Corp.), is the newly-ordered 65-ft twin-screw craft to be delivered to the Mill Ridge Coal Co.

ONE of the few boats literally in service "before the paint was dry" is the new 650 hp towboat, *Ernest Mack*, equipped with two Caterpillar engines. It was built by Vicksburg Marine Ways for M & M Towing Co. The boat was chartered to Jesse Brent, Greenville, Miss., before the paint job was fully completed!

THE Cummins Illinois Engine Sales, Inc., reported the sale of a Cummins Engine Model VT-21M to provide the 600 hp for the 110 ft boat, the *Waldmor* owned by Podbielniak, Inc.

THE gasoline and oil trade was noticeably active on the Ohio River, with the 27-year-old Hercules powered *Philo* carrying a fair share of the towing load for the Pihl and Miller fleet at Pittsburgh.

FAVORABLE reports continue to come in on the *Hawkeye*, the newest fleet addition for the Midwest Towing Company. This twin-screw craft has many favorable admirers, with the Cooper-Bessemer JS engines creating talked-about performances, reportedly capable of handling a 21,000-ton load.

GM DETROIT DIESEL PARTS

—factory-engineered for long life, low-cost service

SHADOWGRAPH CHECKING is one of the precision tests that assure highest quality of factory-engineered GM Detroit Diesel original and replacement parts. In this photo, a magnified piston ring groove is compared with a perfect standard graph. This precision control is important to piston lubrication.

Scientific packaging of GM Detroit Diesel parts assures protection both in shipment and storage.

You're always money ahead when you buy factory-engineered GM Detroit Diesel parts from your Distributor or Dealer

GM DIESEL POWER

DETROIT DIESEL

Engine Division of General Motors • Detroit 28, Michigan

IN THE Chicago area, two towboats, the Winton-powered *Dernier* and the Caterpillar-powered *Caillou* have been purchased to serve as the nucleus fleet for the newly-formed Calumet Harbor and Lake Towing Company.

THE tiny 450 hp *Helen Z* turned more than a few river heads as the Fairbanks-Morse engines supplied the power for pushing a big double-lockage tow on the Upper Ohio.

COAL trade revived on the Ohio, too, and we saw the still-new *Walter C. Beckjord* performing for the Ohio River Company with the Baldwin-Lima-Hamilton engines used for the push-power for nine barges of coal, and one of coke.

ON THE Illinois River, the familiar sight of the *Frank L. Blaske* using its power from the Atlas-Imperial engines to handle a neat tow, brings to mind the news of the renowned Capt. H. C. Blaske's retirement from the Blaske Lines, (now a part of American Commercial Barge Lines.)

Yellow Transit Expands

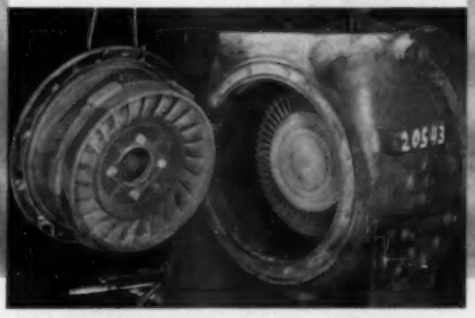
Yellow Transit Freight Lines, Inc., one of the nation's growing haulers of general commodities, both truckload and LCL, is banking heavily on diesels as the Company continues its remarkable progress. Yellow Transit, which has shown healthy growth in recent years, had a gross revenue of $12,392,064 in 1956 and on August 1 nearly doubled the size of its operation with the annexation of Michigan Motor Freight Lines, Inc. In connection with this expansion, Yellow Transit is placing an additional 80 over-the-road units into service. Cummins JT-6-B diesel engines power the cab-beside-engine Kenworth trucks which pull Fruehauf aluminum high cube trailers. The units have Fuller 5A-65 five speed transmissions. The 80 new units join 222 Cummins JT-6-B powered Kenworths which have been in service since YT went diesel in August of 1955. Yellow Transit now operates out of 36 terminals in the states of Missouri, Kansas, Texas, Illinois, Oklahoma, Indiana, Michigan, Ohio and Kentucky. Fourteen of these terminals were added with the annexation of Michigan Motor Freight August 1.

Probably the most significant development in the recent history of YT was the replacement of its over-the-road fleet with high cube trailers, cab-beside-engine tractors powered by Cummins Turbodiesel engines. Yellow Transit's management attributes a high degree of its success of its lightweight equipment, and particularly the diesels. "In my opinion, the Cummins JT engine is one of the finest engines available today for the size road equipment we operate," said George Powell Jr., President. Mr. Powell added that prior to Yellow Transit's purchase of diesel equipment, gasoline-powered equipment was used exclusively. "Although we were unfamiliar with diesels at first, a thorough cost study revealed the economies possible with the diesel on our road operations. Basically, the Cummins JT has done the job at the costs anticipated."

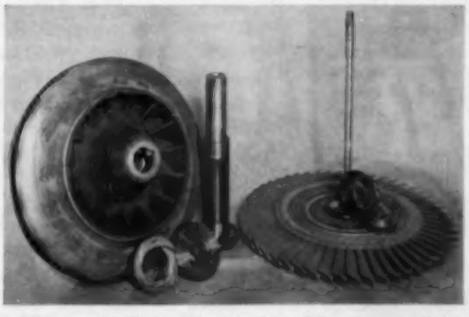
Said the Company's safety engineer, Wayne Henderson: "Our drivers like the Cummins Engine. The extra power enables us to maintain steady road speeds and perform on schedule, whether it be in the level country of Texas and Oklahoma or the hills of the Ozarks. The JT's are really doing the job." Yellow Transit has made great strides forward since the company was founded by A. J. Harrell as a taxicab company in 1924. Especially has great progress been made over recent years. With the annexation of Michigan Motor Freight to provide Yellow Transit service to virtually all of the industrial cities of Ohio, Indiana and Michigan the Company takes another great forward step.

after 35,000 hours of service . . .
this ELLIOTT turbocharger
is still in good running condition
(It operated continuously—24 hours a day—for four years)

Inspection (of the blower end) by turbocharger engineer reveals remarkable condition even after four years service.



A view of the turbine end of the Elliott turbocharger shows only slight erosion on the turbine blades and nozzle ring.



After complete disassembly, inspection of the rotors revealed little or no evidence of wear on the journals, thrust faces, and bearings.

dependable operation
with ELLIOTT turbochargers!
for two-cycle and four-cycle diesel engines
175 hp and up

Here's what happens to Elliott-engineered turbochargers under continuous 'round-the-clock operation. Serving gas-engine compressors in a midwestern pipeline compressor station, this turbocharger was originally installed four years ago. When shut down and returned to the Elliott plant for inspection, it was found to be in good running condition after *35,000 hours of service.* This outstanding record of dependable service is further proof of Elliott's superior design and workmanship. That's why it pays to specify Elliott for all turbocharger requirements.

ELLIOTT Company
Turbocharger Department
JEANNETTE, PENNSYLVANIA

M7-2

Diesel Notes Around The World

By F. Hal Higgins

ALLIS-Chalmers Construction Machinery division is putting torque converter drive on its HD-16G and HD-21G tractor shovels to meet the demand for bigger and faster front-lift tractor shovels on heavy dirt moving dam and road jobs over the world. A-C's diesel engines power the two shovels. Extra long tracks for better balance and 360 degree visibility are in the new design. Bucket capacities are 3 and 4 yards.

CALIFORNIA Highways and Public Works, official publication of the State for those departments, gives two full pages illustrated with pictures of a Cat diesel motor grader with the automatic blade. It is described by Resident Engineer Kirst of the state highways as a "device enabling an equipment operator to accurately and economically produce a graded surface of specified cross slope in street, highway, airport and subdivision work." Guess work is largely eliminated for a big saving.

FERRY & Crow's contract on the Carquinez Project north of Oakland is the most talked about earth moving job in years, according to *Western Construction*. First, the soil breaker, a flat steel plate attached to the ripper tooth to rip up layers of soil and rock instead of riding out; Forrest Johnson Landleveling Co. in S. Calif. developed it in 1955. Then, scrapers loaded and hauled in tandem, just being started when your reporter looked over the job 15 months ago, has gone over to make the contractor a sure winner where competitors were talking Ferry-Crow would lose their shirts after they ran into rock that called for blasting on the big cut back of Pinole.

FRATELLI Luglufu Ettore, Capri, Italy, informs us of their new small diesel tractors. The Golia is powered by an Enfield 10 hp engine. Their Junior is powered by a 6 hp Guldner engine built in Germany. Their fourth small tractor is the Lilliput with a 7 hp Enfield diesel. They are employed largely in industry—factories, shipyards, air fields and kilns. Big oil companies—Shell, Esso Standard, etc.—use them in many areas.

MERLIN Engineering Company, Limited, in England, announces the *B. M. Calimaster* test bench for diesel engines.

PETTER announces its new air cooled PC diesel engines in single, twin, 3- and 4- cylinder models.

PERKINS of Peterborough, England, is bringing out an industrial version of its new Perkins P7/144 for road construction machines.

THE ARGENTINE is finally starting to build some of its own farm machinery. Miguel Gardiol of Santa Fe province is building the Susana combined harvester powered with an English Perkins diesel, of 58 bhp.

DUTCH contractors are using fleets of American crawler diesels on the big plows specially designed to work as deep as 6 ft on the old Zuider Zee bed being reclaimed for more farm land.

MASSEY - Harris - Ferguson's Australian subsidiary company, called H. V. McKay Massey Harris Pty. Ltd., is building the Massey-Harris 745 diesel. Engine is a Perkins with 40 hp on the drawbar.

THE first Australian production of Oliver tractors was announced in August, 1957. "The first crawler tractor production in Australia is being carried out by Oliver Australasia in conjunction with British Standard Machinery Co.," said the announcement. The Oliver OC-12 is an achievement in blending of American design with Australian materials and skill, it adds.

MINNEAPOLIS-Moline announces the GB Diesel tractor for the Australasian trade. Maximum belt hp is put at 65.

AUSTRALIA is to get the new "Land Rover" diesel engines late this year, according to announcement by the director of Rover Australia Pty. Ltd. The new engine, which is the result of two years research, develops 52 hp at 3500 rpm.

GREENVILLE Steel Car Company is now furnishing John Deere 420 crawler tractors with its Ateco loader. This is an industrial type aimed at more of the road and street jobs. Bulldozer blade and adjustible lift fork are also available for the same tractor.

DIAMOND Match Co.'s new plant at Red Bluff, Calif., has just shipped its first production of finished pulp products from its multi-million dollar plant. Diamond Match's logging operations are models of teamed diesel drive in tractors and trucks to cut costs in its production.

SALT production in the San Francisco Bay area is a highly dieselized mass production industry. Leslie harvests its salt farms by the use of six diesel-powered Leslie-designed harvesters to rip up load and pile some 20,000 tons of salt daily. I can recall about thirty years ago when tractors were first introduced to step up production.

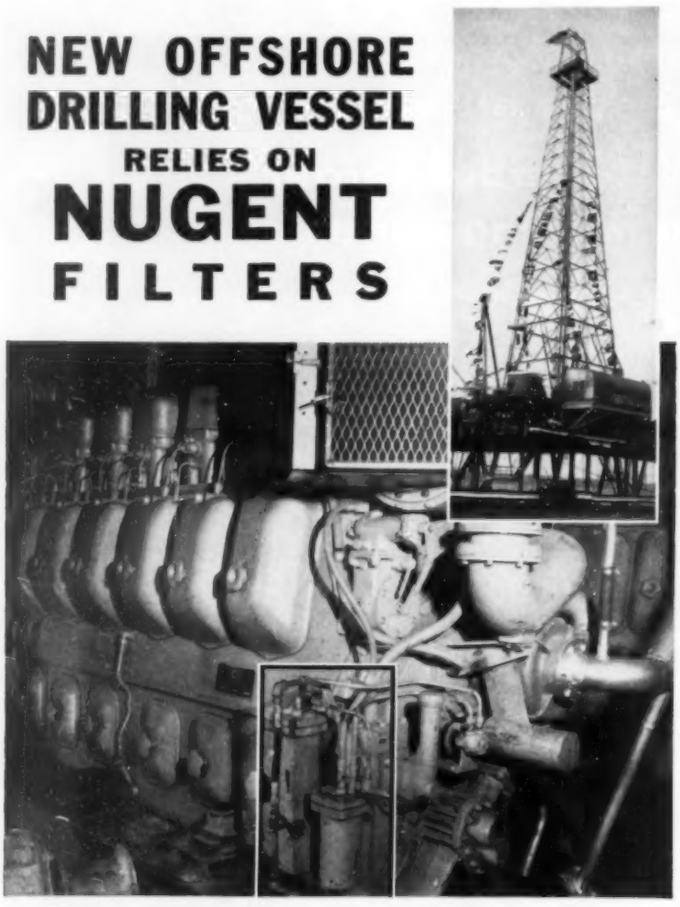
YALE & Towne now offers a line of Trojan Loadsters with Hercules and GM diesel engines to power them. The Trojans are another competitor in the red-hot front loader field.

Names New Officers

The list of Officers who will head the Waukesha Motor Company's management group was announced by James E. DeLong, President, following a Directors' Meeting held at the close of the Annual Meeting for Stockholders in the Company's Waukesha Headquarters.

Named by DeLong as Executive Vice-President is Charles E. Nelson, Jr. J. Grant Swain is Vice-President of Sales,

NEW OFFSHORE DRILLING VESSEL RELIES ON NUGENT FILTERS



Another new Offshore Drilling Vessel has joined the fast growing fleet of mobile units operating in Gulf of Mexico waters. She's the Delta Offshore No. 1, whose drilling machinery is entirely diesel electric driven. In addition, the three Alco diesel electric generator units making up her main power plant, supply power for air conditioning, lighting and television.

To help guard against costly power failures, Nugent fuel oil filters were selected as original equipment on the Alco Diesels . . . another example of a leading manufacturer providing valuable equipment with the best protection possible.

By removing foreign particles as small as two microns from the fuel supply, Nugent Filters practically eliminate faulty combustion due to clogged injection ports. When employed as lube oil filters, they prevent harmful impurities from reaching vital engine parts, thus greatly increasing engine life.

If you would like to make good equipment better . . . investigate the advantages of Nugent filtering. Descriptive literature available upon request . . . outline your needs . . . we do the rest.

ESTABLISHED 1897

WM. W. NUGENT & CO., INC.
3441 CLEVELAND STREET, SKOKIE, ILLINOIS

REPRESENTATIVES IN PRINCIPAL CITIES

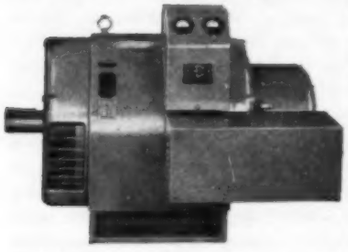
OIL FILTERS • STRAINERS • TELESCOPIC OILERS
OILING AND FILTERING SYSTEMS • OILING DEVICES
SIGHT FEED VALVES • FLOW INDICATORS

and Newton H. Willis is Vice-President of Engineering. Secretary and Treasurer of the Company will be Lewis W. Youker. Joseph J. Kleinbrook was named Assistant Secretary and Assistant Treasurer. Mr. DeLong said that this new executive line-up would give clearer definition to the Officers' management duties, in the anticipated increased production and sales activities in the future.

Get the latest!

A COMPLETELY NEW "PACKAGED" GENERATOR

AMP-PAK



AMP-PAK Generator shown is rated at 187 kva, 1200 rpm, 240/480 volts. AMP-PAK is available in ratings of 75 thru 187 kva at 1800 rpm and 62½ thru 187 kva at 1200 rpm. Three phase, 80% PF, 60 cycles, 50C rise, and 120/208, 240 and 480 volts.

No exciter... No moving parts in the voltage regulator

AMP-PAK is a compact, revolving field a-c generator with built-in, static excitation system; static voltage regulator; and basic metering and controls conveniently grouped. AMP-PAK is a portable unit, factory assembled, internally connected, and tested.

No rotating exciter to maintain. D-C excitation is provided by a heavy duty, long-life, static rectifier.

No tubes, relays, vibrators to service. Voltage is regulated by a static, E-M-developed sensing circuit and "magical" magnetic amplifiers.

Holds voltage "rock-steady" so your motors, lights, and electronic equipment will work better. The static regulator provides ±2% regulation.

Starts big motors. A special, built-in voltage booster transformer stands by to reinforce line voltage when heavy loads are suddenly applied.

Easy to install. Needs no switchboard. Just connect load to AMP-PAK thru a suitable line switch.

Simple to operate. Has no belts, no "tricky" commutator, no adjustments—anyone can operate AMP-PAK.

See your nearest E-M Sales Engineer and write the factory for publication PRD-236.

E-M

ELECTRIC MACHINERY MFG. COMPANY
Minneapolis 13, Minnesota

Largest manufacturer of "Packaged" Generators

2100-TPA-2154

Purchases Hydramotive

The American Bosch Arma Corporation has purchased Hydramotive Inc., of Cleveland, Ohio, according to Charles W. Perelle, president. Hydramotive has developed a hydraulic starter known as the Hydrotor for all types of diesel and gasoline engines. In announcing the acquisition of Hydramotive, Perelle pointed out that the Hydrotor has a highly appropriate place in the product line of the American Bosch Division, which has been for many years a large producer of diesel fuel injection systems in this country. He added that the large group of central distributors who have for many years marketed American Bosch diesel and automotive electrical products would undoubtedly be interested in adding the Hydrotor to their lines.

The Hydrotor system is composed of three main units, the hydraulic starter which incorporates a positive displacement hydraulic motor for rotation, a hydraulic pressure accumulator for storing up sufficient pressure for several starts, and a hydraulic pump either hand-operated or engine-driven. The choice of a hand or engine-driven pump depends on the needs of the engine operator. For example, operators of diesel motorships might prefer hand pumps since their equipment is started only once during a trip. On the other hand, bus and truck lines may choose an engine-driven pump as their equipment may be started many times during a work day.

West Coast Plant

Mack Trucks, Inc. announced recently it will build a major manufacturing plant on the West Coast. P. O. Peterson, Mack president, said the new plant will be located at Fremont, Cal., about 33 miles southeast of San Francisco on the East Shore Freeway. "The increasing demand for Mack equipment in the Western states has made this a priority project in our expansion program," Mr. Peterson explained. "The West is one of the fastest growing areas in the United States, and a production plant in that region will greatly facilitate service to our many Western customers."

The new plant will be constructed on a 50-acre site in the southwest section of the city of Fremont. "As further illustration of Mack's faith in the growth potential of western business, particularly our own business volume in this region, we also have taken an option on an additional 50 acres of land adjoining the plant site to permit expected future expansion needs," Mr. Peterson stated. He said future plans call also for construction at the Fremont location of a large west coast parts depot, executive offices and extensive service facilities. He stressed however that the new manufacturing plant will be the initial project, and that the other facilities will be erected as needed. Construction of the new manufacturing plant will get underway as soon as the building plans are completed. Mack, whose sales have more than doubled in the past two years, already has six sales and service branches in the Far West. They are located at Los Angeles, San Francisco, Portland, Seattle, Salt Lake City and Eugene, Oregon. Currently, manufacturing operations are conducted at Plainfield and New Brunswick, N. J.; Allentown, Pa.; Cortland, N. Y., and Sidney, Ohio. The Fremont plant will be the company's first Western manufacturing facility.

Young

keeps vital engines cool in desert hot-spot!

1,000 hp units operate at full load in world's hottest location

Not even the fierce heat of Kuwait or general water shortage in the area can impair the efficiency of the Young equipment used to cool the jacket water, supercharger intercooler water and engine oil on the engines of the four 1,000 hp pumping units designed and built by the Enterprise Division of General Metals Corporation of San Francisco.

Young equipment identified above: (1) Radiator Model MWC-455 with separate cooling sections for jacket water-supercharger intercooler water and engine oil. (2) Young Mono Weld ® construction turbo-charged air intercooler. (3) Model OCS-300 Torque Converter Cooler.

"WHERE QUALITY COUNTS"

Let Young Radiator solve your heat transfer problem. Write today to Dept. 407-M for catalog 1356. There is no obligation.

Young RADIATOR COMPANY
RACINE, WISCONSIN
Creative HEAT TRANSFER ENGINEERS
Executive Office: Racine, Wisconsin, Plants at Racine, Wisconsin, Mattoon, Illinois

P&H Diesel Sales Manager

F. C. Langston, Jr.

Mr. F. C. Edwards, Vice President of Harnischfeger Corporation's Diesel Engine Division at Crystal Lake, Illinois, has announced the appointment of Mr. F. C. Langston, Jr., to the post of Sales Manager. Since joining the company four and one-half years ago, Mr. Langston has spent considerable time working with both the Engineering and Sales Departments on new diesel engine applications. Mr. Langston served over fourteen years with General Motors Corporation's Electro-Motive Division prior to joining P&H in 1953. In his new position he will direct the activities of the entire diesel sales force and concentrate his experience on opening up new markets for Harnischfeger's line of lightweight, heavy-duty, two-cycle diesel engines.

Job Eased With Torque Converter

Of the various advantages offered by torque converters in powered machines and equipment, probably the least publicized but most greatly appreciated by the operator is the handling characteristics achieved through the fluid drive. A good example of how this feature is profitably applied can be found in the construction work at Alco's Warrick Works, now under construction near

Evansville, Indiana. Here two erecting cranes are handling unusually delicate steel setting operations in the building of 16-story structures for a power plant. The machines are part of the equipment operated by John F. Beasley Construction Co., Chicago. One is an American Hoist & Derrick Model 140 powered by a Cummins diesel engine, and the other is an Manitowoc Model 3500 using a Caterpillar D17000 diesel engine. Both engines are equipped with Twin Disc three-stage torque converters. One of the tasks these two machines perform is setting heavy cross members, up to 29 tons, between columns. Then, using a ball weight, the machines' operators gently tap the cross members into place. The torque converter drive proves ideal for this type operation for it permits holding and delicate inching of the load. The operator need only manipulate the engine throttle control to "feel" the load smoothly and accurately into position.

YOUR SHOP CAN POSITIVELY

GUARANTEE HORSEPOWER

with Clayton's Engine Dynamometer!

Here's the practical, universal Engine Test Machine! Guaranteed h.p. means profit. Guaranteed h.p. helps your operation—indeed, *it's the profit insurance you need!* Clayton offers you many advantages. Clayton universal mounting adapters speed diesel and gasoline engine test procedures. Engines up to 1200 h.p. set up in minutes. Alignment is automatic. The Clayton Engine Test Stand, with these adapters and the Clayton cooling system—combined with a Clayton Series 17 Engine Dynamometer—gives any engine rebuilding establishment a speedy, practical test facility.

Clayton

ENGINE DYNAMOMETER . . . complete with
ENGINE TEST STAND equipped with
UNIVERSAL MOUNTING ADAPTERS and
UNIVERSAL ENGINE COOLING SYSTEM

Write Now! LET CLAYTON'S PLAN SHOW YOU THE WAY TO ABSOLUTE PROFITS!

For specific information on how the Clayton Engine Test package can be applied to increase the profits of your particular operation, mail this coupon or write us on your business stationery. Be sure to name the engines you service.

NAME TYPE OF ENGINE SERVICED_____

NAME_____

FIRM_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

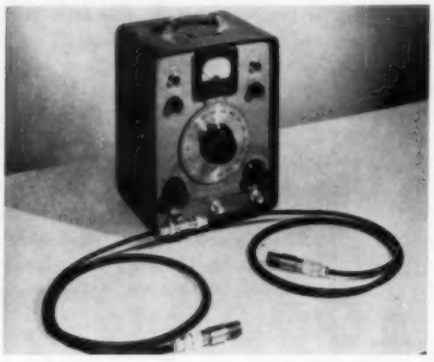
SEND TO CLAYTON MANUFACTURING CO., BOX 550, EL MONTE, CALIFORNIA

Fuel Pump Test Stand

Shown above is a Diesel Fuel Injection Pump Test Stand recently designed and built by the Test Equipment Division of Consolidated Diesel Electric Corporation for testing Roosa-Master Hartford Machine and Screw Co. pumps. The test stand, Con Diesel Model HMS-1000, can be adapted to test other pumps, such as equivalent American Bosch and Bendix pumps. It has a speed range of 200 to 2,000 rpm recorded on an electric tachometer and is powered by a reversible drive 1½ hp, 220V, 60 cycle infinitely variable speed motor. The burrette bank assembly is completely sealed to prevent dirt from entering the system. The burrette tubes fill from the bottom to eliminate bub-

bles and provide immediate and accurate readings. An electric heater circuit for raising temperatures of fluid under test is optional. For more information write Consolidated Diesel Electric Corp., Stamford, Conn. (ITS NEW)

New SLM Indicator



Both fast and slow transient differential pressures at any two points in a pneumatic or hydraulic system, as well as on an aerodynamic model, can now be measured with the new Kistler SLM Differential Pressure Indicator, (Model DPI-114). Introduced by the Kistler Instrument Corp., North Tonawanda, N.Y., this unique instrument, can also be used for short term measurements of the difference or sum of steady pressures at any two points. It is a fast-response, crystal type transducer that can be calibrated by conventional static methods. Hookup is simple: Two separate SLM pickups of opposite polarity are independently mounted in the system with no connecting passage or special plumbing required. Diaphragms are positioned flush with chamber walls. When the signal leads (of any length) are joined together, the resulting difference in signals is measured with the Kistler Piezo-Calibrator and displayed on a standard oscilloscope or recorder. This unusual system has been made possible with the recent development of the new Kistler SLM PZ14R Pressure Pickup with positive polarity. Momentary grounding of the input signal, to remove all the electrical charge generated by the steady component of pressure, makes possible the measurement of a 0.1 psi change in differential pressure at a 3000 psi level. The same pickup is used for all pressure ranges to 3000 psi, with high pressure adaptors extending this range to 100,000 psi. Frequency range of the pickup is 0 to 50,000 cps, with capacity for continuous operation at 600° F. Because the sensing element is extremely rigid, the inertia of a column of liquid in front of the pickup has little effect on its response. The SLM Indicator has many other uses.

Pressure or pressure rate can be measured directly with the Standard PZ14 and PZ14R Pickups. They also make force transducers. An accelerometer attachment converts the basic pickup into a precision vibration indicator that can be statically calibrated. The standard Kistler Piezo-Calibrator in conjunction with simple polarized capaciter pickups, constitutes a very sensitive motion and displacement indicator. For further information, write: Kistler Instrument Corp., 15 Webster St., North Tonawanda, N.Y. (ITS NEW)

Personnel Changes

W. B. Morse

A number of changes in personnel have recently been annuonced by Robert H. Morse, Jr., President of Fairbanks, Morse & Co., Chicago manufacturers. Page S. Procter, who has for many years been Manager of the company's New Orleans Branch, is retiring effective January 1, 1958. W. F. Wahlenmaier, who has for the past few years been Manager of the company's Portland Branch, is taking over the post vacated by Mr. Procter. Milo C. Roy, who has been with the company many years, being Branch Manager at St. Paul, Omaha, and for the past eight years of the Chicago Sales and Service Branch, is being transferred to the Portland Branch succeeding Mr. Wahlenmaier. W. B. Morse, who has been with the company many years in a number of positions including Manager of the company's Sub-Branch, Detroit; Assistant to the Chief Product Engineer; Assistant to Coordinator of Government Business; and more recently Assistant to the Manager of the Chicago Branch, has been promoted to Manager of that branch effective October 1, 1957. Edward E. Lynn has been named Director of Personnel of the company succeeding L. R. Gaiennie who recently resigned. Mr. Lynn was a partner in the law firm of Thompson, Raymond, Mayer, Jenner & Bloomstein which has served as counsel to Fairbanks, Morse & Co. for over a quarter of a century.

DIESEL ENGINE CATALOG

The purpose of this little advertisement is to tell you about Volume 22 of DIESEL ENGINE CATALOG which is now available, entirely revised and rewritten. This is the 22nd edition of the book that has earned the name of "the bible of the industry."

All smart diesel engine salesmen carry this book around in their car. When they run into some new competition with which they are not too familiar, the DIESEL ENGINE CATALOG gives them full, accurate information when they need it most.

The consulting engineer keeps this book in his reference file. It immediately gives him *all* data on diesel engines coming within a given horsepower range, speed range and weight range.

People who sell, people who buy, people who use diesel engines need this new, fully illustrated, up-to-the-minute volume. It has been completely revised and expanded. Orders are now being accepted for this latest edition. Price $10.00 prepaid.

Add California Sales Tax for Delivery in That State

DIESEL PROGRESS
816 NO. LA CIENEGA
LOS ANGELES 46, CALIFORNIA

STOP NOISE-Positively
with
BURGESS-MANNING SNUBBERS
They are engineered to your requirements with GUARANTEED results.
They are available together with spark arresting—water separating—or, heat recovery. They provide noteworthy savings thru no maintenance, as well as greater equipment efficiency and effectiveness. Also, consider Burgess-Manning Snubbers for your Intake Silencing Requirements.
Present your problems for Recommendations.
BURGESS-MANNING COMPANY
Sound Engineering
747 East Park Avenue, Libertyville, Illinois
Dallas, Texas

West Coast News

By James Joseph

FOR General Telephone Company, Pico, Calif., a 6 cylinder, 180 hp model 49B4½ Fairbanks-Morse diesel generating set.

FOR HIS Mack B 61ST truck, Seattle's Sam Lawrence has purchased a Cummins NH model engine from Cummins Diesel Sales of Seattle.

DELIVERED to Seattle's Star Machinery Co.—Two GM power units (Model 60-30C and 4030C) for use in Katolight generator sets.

TO BENN C. Gerwick, San Francisco, a Fairbanks-Morse model 45B3¼, 5¼ hp diesel engine.

SOLD to Paul's Hardware, Elko, Nevada —a 2 cylinder, 18 hp model 48AS4 Fairbanks-Morse diesel unit.

KENWORTH 803-Bs, with a gross weight of 228,000-lbs, and installed with Cummins NVH-1200 engines, are operating as rock and ore movers at Kaiser Steel Corp's mines near Indio, Calif.

FOR the Charles A. Langlais Co., San Francisco, a 6 cylinder, model 49B4½, 180 hp Fairbanks-Morse diesel engine.

A DIRECT current 5¼ hp diesel generating set, a Fairbanks-Morse model 45B3¼, has gone to Honolulu's P. S. Pell & Company, Ltd.

INSTALLED: a GM 6-71 series diesel in a rock crushing plant operated by Harold Weston, Olympia, Wash.

FOR Seattle, Washington's Sam Lawrence—a Cummins NH, 220 hp engine to power his Mack B-61-ST truck. Sale via Cummins Diesel Sales of Washington, Inc.

POWERING a Mack B-753-LS truck, belonging to Ambrose Refrigeration Service, Butte, Montana, is a Cummins NTO-6-B, 262 hp diesel.

TO SERVE as an auxiliary on a new boat, Bellingham Marine, Inc., Bellingham, Wash., has taken delivery of a GM 4-71 diesel. Sale by Evans Engine & Equipment Co., Seattle.

LEICH Sales Corp., West Los Angeles, has taken delivery of a 6 cylinder, 180 hp, model 49B4½ Fairbanks-Morse generating set.

FT. BRAGG, Calif's Union Lumber Co. is operating three Kenworth model 849 logging rigs powered by 335 hp Cummins NRTO engines.

Shop Bulletin

Bacharach Industrial Instrument Company has issued a technical bulletin illustrating and describing the layout, facilities, testers and tools required for operating an efficient Diesel injection service shop. This bulletin gives specifications on area, lighting, ventilation, and equipment; as well as a suggested layout which facilitates smooth, uninterrupted servicing of all Diesel fuel injection components. Also described in the bulletin are all of the items necessary for testing, cleaning, and adjusting operations in servicing the smaller types of Diesel injection equipment such as American Bosch R, S and T Nozzles, American Bosch APE-A and PSB Pumps, and similar injection equipment made by Hartford Machine Screw Company (Roosa-Master), John Deere and International Harvester. Fixtures and tools for servicing General Motors Injectors and Cummins injection equipment are also available for shops servicing these lines. Request Bulletin 929 from Bacharach Industrial Instrument Company, 200 N. Braddock Avenue, Pittsburgh 8, Pa.

FAMOUS LAST WORDS:

"they wouldn't dare"

That's what they said the day before Pearl Harbor. Remember? But by now you'd think people would have learned. Let's face it—we must be ready for disaster at any moment. It may be an atom bomb—or it may be a fire, a flood, a hurricane. It's only common sense to be prepared for it, whatever it is. Take these precautions TODAY:

- ☐ **Enlist the help** of your local Civil Defense Director.
- ☐ **Check contents** and locations of first-aid kits.
- ☐ **Send staff** to Red Cross courses. They may save your life.
- ☐ **Promote preparedness** in your community. Your local CD Director can show you how.

Set the standard of preparedness in your plant city—check off these four simple points NOW.

SPACE FOR THIS **CIVIL DEFENSE** MESSAGE CONTRIBUTED BY

Ros. F. Hadman

Gulf Coast Diesel Notes

By Michael T. Pate

FERGUSON-Steere, Big Spring, Texas, has secured from Cummins Sales & Service, Fort Worth, Texas, the first of five model JT-6-B Cummins diesels. These 175 hp diesels will be used to power GMC-630 trucks for petroleum tank trucking.

GARDNER Denver Company, Dallas, Texas, has bought from Waukesha Sales & Service, Inc., four model 6NKDU Waukesha diesel engines, each rated 258 hp at 1100 rpm, which will be used to drive gas compressor units.

BETHLEHEM Supply Company, Tulsa, Oklahoma, has bought from Stewart & Stevenson Services, Inc., Houston, Texas, five model 20DA oilfield utility units, each powered by a series 71, model 2030-C, 30 hp General Motors diesel.

BURTON Miller Construction Company, Clinton, Oklahoma, has secured from Waukesha Sales & Service, Inc., Houston, Texas, two model 6LRDBU Waukesha diesels, rated 381 hp at 1100 rpm, which will be used to drive 150 kw generators.

NATIONAL Supply Company, Houston, Texas, has taken delivery from Stewart & Stevenson Services, Inc., Houston, of a General Motors model 524-2406 quad-6 diesel which will be used to power a National drawworks for overseas operation by Shell Oil Company.

PARKER Bros. & Company, Inc., Houston, Texas, has taken delivery of a 12-cylinder, Model 38D8⅛, Fairbanks-Morse non-reversing marine diesel engine, rated at 1920 hp. The diesel was secured from the diesel division of Fairbanks, Morse & Company.

SAN Antonio Machine & Supply Company, San Antonio, Texas, has bought from Waukesha Sales & Service, Houston, two model 6LRDBU Waukesha diesels; each engine will be used to drive a 150 kw generator.

BAROID Sales Division, National Lead Company, Houston, Texas, has secured from Waukesha Sales & Service, Inc., Houston, a model 190DLCU Waukesha diesel, rated 66 hp at 2000 rpm. The diesel will drive a centrifuging machine.

JESS Radle & Son, Waco, Texas, have bought from Stewart & Stevenson Services, Inc., Houston, Texas, two series 71, model 2061-A General Motors diesels which will be used to drive agricultural equipment. They are rated 34 hp each.

FINAG, C. A., Puerto La Cruz, Venezuela, S. A., has bought from Stewart & Stevenson Services, Inc., of Houston, Texas, a series 71, model 2030-C General Motors diesel. The two-cylinder engine, rated 34 hp, will drive an Aurora 5Cx6 GGV centrifugal pump.

SOUTHERN Fleet Leasing Corporation, Houston, Texas, has secured from Waukesha Sales & Service, Inc., of Houston, a model 135DKU Waukesha diesel rated 106 hp at 1800 rpm. The diesel will drive a 40 kw generator and is unitized with it.

CARDWELL Manufacturing Company, Wichita, Kansas, has taken delivery of two Stewart & Stevenson model 20DA oilfield utility units, each powered by a General Motors series 71, model 2030-C diesel. Sale was made by Stewart & Stevenson Services, Inc., of Houston, Texas.

C. G. UNLAUB Company, Dallas, Texas, has bought a 50 kw Stewart & Stevenson ac generating set driven by a model 71, series 3030-C General Motors diesel. The 75 hp diesel will drive the screening unit for the company's rock-crushing plant. Unitization and delivery was made by Stewart & Stevenson Services, Inc., of Houston, Texas.

GARDNER Denver Company, Houston, Texas, has taken delivery of a model 190DLCU Waukesha diesel from Waukesha Sales & Service, Inc., of Houston. The diesel, rated 106 hp at 1800 rpm, will be unitized with the company's equipment.

A.B.C. Contracting Company, Dallas, Texas, has taken delivery from Stewart & Stevenson Services, Inc., Houston, Texas, of a 400 kw ac generating set, powered by two General Motors series 71, model 12103 twin-6 diesels. The unit will drive a portable rock crusher.

LOFFLAND Bros. Drilling Company, New Iberia, Louisiana, has taken delivery through Mid-Continent Supply Company, Fort Worth, Texas, of a model 6LRDBSU Waukesha diesel, rated 540 hp at 1100 rpm. The unit was furnished by Waukesha Sales & Service, Inc., Houston, Texas.

GASTON Hospital, Dallas, Texas, has taken delivery through Gotham Electric Company, Dallas, of a Stewart & Stevenson 35 kw generating set which will furnish emergency power. The generator is driven by a series 71, model 2061-A General Motors diesel.

Testing Laboratory

Weighing a particle as light as a pencil mark or exerting pressure of 150 tons per sq in. on a sample of steel is all in a day's work at the new Production Metallurgical and Materials Testing Laboratory at Caterpillar's Peoria, Ill., plant. One of the world's most modern facilities of its type, the Laboratory's function is to insure that all materials used in the manufacture of Caterpillar machines are rigidly controlled throughout all stages of manufacture, and to develop new metallurgical practices and methods of evaluation. The new Laboratory, constructed as part of the Company's growth program, occupies 22,000 sq ft of laboratory and office space and employs more than 150 people. Designed with an eye toward the future, the new facility has been planned to allow additional equipment to be added as it becomes necessary.

The personnel of the laboratory have many responsibilities. All new products emanating from suppliers are evaluated. New methods of testing are developed to achieve the highest possible accuracy. Control of all materials must be maintained during processing. Proper process procedures are designated for standardizing operations. Tooling and other equipment is prescribed to meet metallurgical requirements and new applications are developed. Data is provided to personnel concerned with improvement of product or manufacturing techniques. Laboratory personnel assist in the making of purchasing decisions and in the inspection of materials. The laboratory tests samples of all materials used in the building of Caterpillar products. Included in the testing are such materials as forgings, castings, bar stock, tubing and ferrous metals, as well as bronze, aluminum, brass of the non-ferrous group. Rubber, cork, plastics, paints, oils, solvents, chemicals and fibres receive extensive examination.

Tests are also run on structural steel and concrete used in building plant facilities. Working under the direction of the Peoria Plant Metallurgist are metallurgical, chemical and welding staff engineers who evaluate new materials, establish testing techniques, prescribe specifications, help solve manufacturing problems and develop new applications.

Another group, the Heat Treat Engineering staff, has the important job of initiating the planning and scheduling of all instructions for production heat treat operations. Heat treat engineers are divided into three sections: conventional heat treat, induction heat treat and development. Most of the applications and much of the equipment involving heat treatment used at Caterpillar were developed by the Company's own people. The heat treat engineering group designates tooling and equipment for all phases of production heat treatment. This responsibility includes not only making sure that heat treating operations are properly maintained and controlled but that techniques and applications to process new parts and improve existing parts are created. The scope of this group's work may be illustrated by the fact that 34% of the 30-ton D9 Tractor is heat treated.

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Sales Appointments

G. A. Bricmont

E. A. Baley

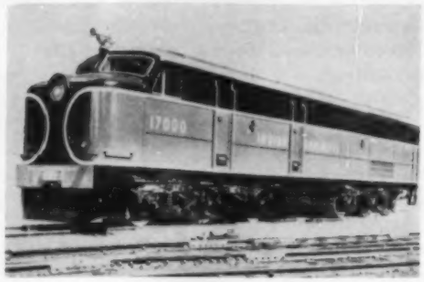
The appointment of Edward A. Baley as Sales Manager and Assistant General Manager and George A. Bricmont as Assistant General Sales Manager has been announced by Wm. A. Humel, Executive Vice-President, The Park Drop Forge Co. Mr. Baley is a 22-year veteran with Park. Mr. Bricmont comes to the company from Erie Foundry Co. where, as Marketing Manager, he was responsible for the advertising, promotion, and sales programming of their new hydraulic and mechanical press lines.

1958 Oil And Gas Power Meeting

As 1957 draws to a close, it is time to bring to your attention the 1958 convention of the Oil and Gas Power Division of the ASME. The meeting will be held in Philadelphia at the Bellevue-Stratford Hotel from May 12 through May 15. Make your plans now to attend this important convention and for those who are planning to have exhibits, get your orders in early to assure yourself of a choice exhibit location. For information regarding exhibits and space reservations contact the exhibits chairman, John E. Onnen, Koppers Company, Inc., 122 So. Michigan Ave., Chicago 3, Ill.

This will be the 30th meeting of the Oil and Gas Power Division and promises to be one of the best. Besides a number of important and interesting papers and sessions there will be many exhibits including engines, accessory equipment and instrumentation of interest to Marine Railroad, Stationary Power Plant, Trucking, Chemical, Petroleum, Earthmoving and Pipeline Industries.

Big Locomotive Shipment



The growing importance of export markets to American industry was underscored recently at a ceremony marking one of the largest single shipments of diesel-electric locomotives ever to leave the Port of New York. The locomotives—20 in all—are the first of 100 streamlined, 1800 hp units being built by Alco Products, Inc. for the Government of India. In addition to comprising the large shipment from the port, the Schenectady-built locomotives are the first of an order totaling 100 from India, and they will be the first broad-gauge mainline diesels in that country. The 100-unit order held by Alco is reportedly the largest ever placed from India with any locomotive builder. B. S. Kalkat, director of the India Supply Mission to the United States, and Arthur C. Mitchell, fuel officer of the Southeastern Railways of India, accepted delivery of the locomotives at the ceremony. Then one of the locomotives in the shipment was hoisted aboard the *SS Belkarin* alongside the Erie Railroad's Pier 1.

The Alco *World* locomotives making up this shipment represent the first production on orders totaling $56 million that were announced by the manufacturer last May. Those orders were for 100 *World* units for India, 18 similar locomotives for Pakistan and 130 road-switching locomotives for Argentina. The *World* locomotive, designed exclusively for export, was introduced by Alco in 1953 and demonstrated in Spain three years ago.

It is now in service in Spain, Pakistan, Peru, Australia and Argentina. The locomotive provides light axle loading and meets the limitations of the Berne Conference international clearance diagram. With only a change in truck width, a modification provided by the manufacturer, the unit can operate on any gauge track in the world, in either high-speed passenger or freight service. The locomotive is powered by the Alco Model 251-B, 12-cylinder turbocharged diesel engine.

Gommel Joins Marquette

R. C. Gommel

R. C. Gommel has been appointed Sales and Service Application Engineer of the Marquette and Massey Division of Curtiss-Wright Corporation, with headquarters at the Marquette Division in Cleveland. Gommel has had 18 years experience with Marquette hydraulic isochronous governors. He formerly operated Pacific Engine Control Co., Emeryville, Calif., as the authorized Marquette-Massey representative for governor sales and service on the West Coast.

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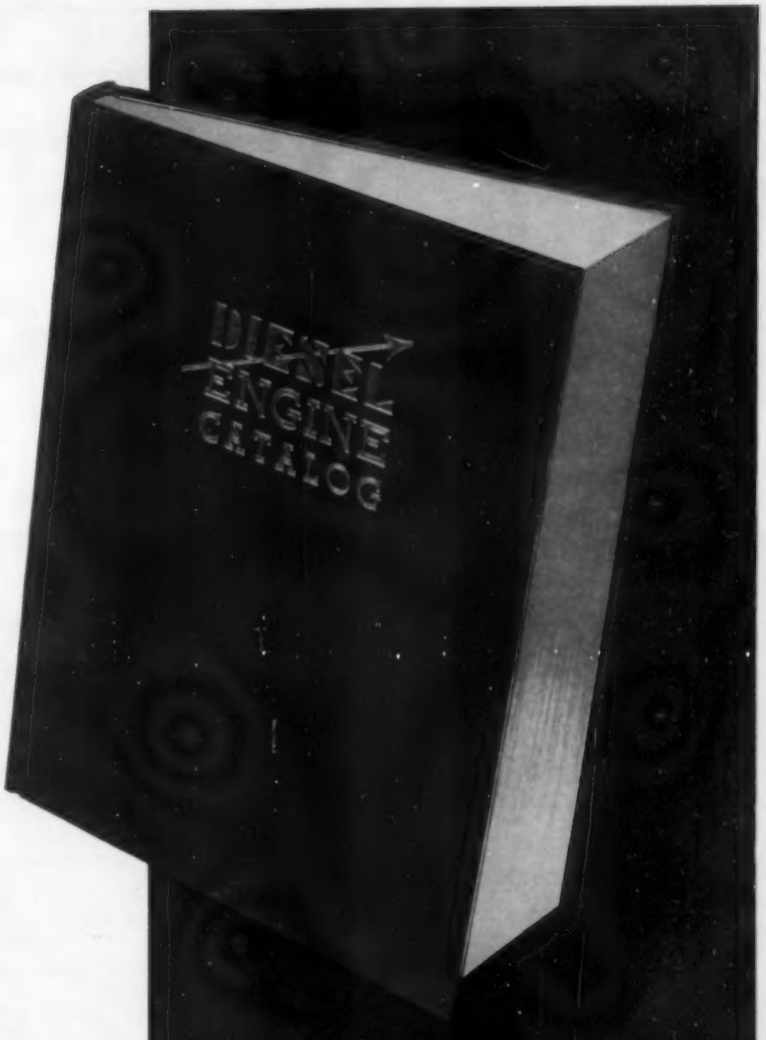

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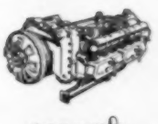

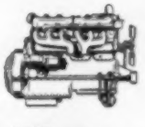

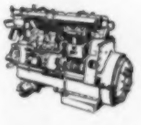

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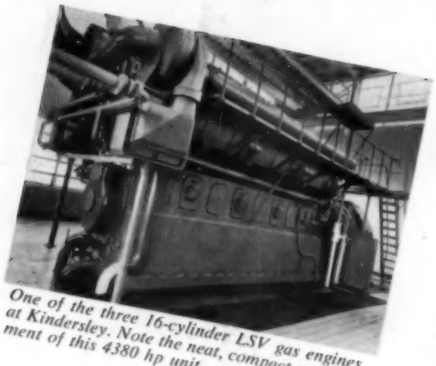

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